Benefits and risks of direct access to treatment by dental care professionals

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Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

Benefits and risks of direct access to treatment by dental care professionals: A rapid evidence review

Final Report to the General Dental Council

29 June 2012

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"any change in policy must be supported by a clear evidence base that such a step delivers significant patient and public benefits and there is no risk of damage. ...There is currently no real evidence base on which to base a policy decision that could have far-reaching consequences for patient safety. "

para. 4.26
British Dental Association submission to the OFT Inquiry into the UK dentistry market
January 2012

"I am happy to report that there has not been any changes to legislation that have added restrictions. There would not be evidence to support making such a change. What we like to say around here is "no one has died on our watch". To give it relevance, dentistry argued that people would die!"

Lisa Taylor
Associate Registrar
College of Dental Hygienists of Ontario June 2012

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Executive Summary

IN BRIEF

- Over 100 research dental and other health-related papers were identified as relevant for this review of direct access. The quality of the evidence regarding direct access issues to dental care practitioners was varied but as a whole of moderately good quality.

- The material was overwhelmingly related to the work of dental hygienists and dental therapists, mostly US in origin.

- There was no evidence of significant issues of patient safety resulting from the clinical activity of DCPs.

- There was strong evidence that access to dental care improved as a result of direct access arrangements, of cost benefits to patients, and of high levels of patent satisfaction.

- There was some evidence that DCPs may over-refer patients to dentists, which may ensure patient safety but lead to wasteful use of resources and a high level of 'no shows' on referral.

- There was evidence of ongoing training needs to strength the assessment and referral skills of DCPs in respect to patients with other health problems or risk factors, but little evidence that dentist are any less in need of such training.

Background

This literature review (rapid evidence review) was commissioned by the General Dental Council (GDC) to evaluate the likely impact, including benefits and risks, of allowing patients direct access to treatment by dental care professionals (DCPs). The review will be used to inform the GDC's Direct Access Task and Finish Group in making a recommendation to Council on this issue by March 2013.

Current GDC regulations require a patient seeking dental treatment to see a dentist first, prior to any treatment by a DCP. Direct access would allow patients to see a DCP without this dentist gatekeeper role. DCPs include dental nurses, dental hygienists, dental therapists,

dental technicians, clinical dental technicians, and orthodontic therapists, and make up over 60% of the dental workforce. GDC registration has been compulsory for DCPs since 2008.

Methodology

The review has involved database searches for research studies evaluating or describing direct access arrangements or issues pertinent to such arrangements. These searches have been in the world-wide literature and cover both dental and other heath-care fields. Extensive enquiries have been made to dental organisations worldwide. However, it should be noted that as a rapid evidence review, it does not claim to be an exhaustive selection and grading of the relevant literature. This is particularly true with regard to grey literature and to papers published in journals which allow restricted access to full text articles through the internet databases available to the team. With the GDC's agreement, searches were restricted to post 1993, the year of the Nuffield Report publication. Inevitably this may have excluded potentially useful publications, particularly those relating to non-dental health care direct access studies.

Results

Altogether over 5.500 abstracts were screened and over 100 relevant full texts, covering both dental and other health care topics, obtained (see Figures 3 and 4). These were then independently evaluated for quality and strength of evidence by two of the review team. Thirty five dental and 57 other health papers were included in the final analysis.

Nine factors emerged from the review as the potential major impacts, including risks and benefits, of introducing direct access. These factors are briefly described below, together with a note of the evidence base for each one.

Benefits

(i) Increased access to preventive and restorative dental care

Ten studies provide evidence that the deployment of dental therapists and dental hygienists in indirect or general supervision or unsupported by a dentist resulted in greater access to and use of dental services by under-served groups and communities (Freed *et al,* 1997, Perry *et al,* 1997, Metz *et al*, 2011, Squillace, 2012, Bolin, 2008, Wetterhall *et al,* 2011, 2010, Calache *et al,* 2009, Simmer-Beck *et al,* 2011, Mitchell *et al,* 2006). Quality of evidence: moderate/strong in 7 of 10 studies.

(ii) Patient satisfaction

Six studies (Freed *et al* (1997), Wetterhall *et al* (2011), Calache *et al* (2009, 2011), Simmer-Beck *et al* (2011), Hakenberg *et al* (2008)) gave consistent findings that patient satisfaction was high and/or dental anxiety low among dental hygienist and dental therapist patients. Freed *et al* (1997) and Hakenberg *et al* (2008) found higher satisfaction amongst patients of independent dental hygienist practices than amongst dentists' patients. Quality of evidence: moderate/strong in 4 of 6 studies.

(iii) Cost savings to patients and the public purse

Three studies (Wang (2011), Baillit *et al* (2008), Devlin (1994)) suggest variable and at most modest benefits regarding cost savings to the patients and service providers. Quality of evidence: moderate/strong in 2 of 3 studies.

Risks

(i) Risks to patient safety

Seven studies looked at different aspects of safety of patients of DCPs. Outcome measures used in studies comparing therapists or hygienists with dentists included anaesthesia complaints (Scofield et al, 2005), recall interval decisions (Wang et al, 1994), care process measures (Wetterhall *et al,* 2010), the quality of restorations and extractions (Bader *et al*, 2011), and diagnoses, treatment and complications (Bolin, 2008). In two studies, dentists' and therapists' opinions of safety aspects of direct access arrangements were reported (Battrell *et al*, 2008), Williard *et al*, 2011). None of these studies report significant issues relating to patients safety. Quality of evidence: moderate/strong in 5 of 7 studies.

Two of the above studies mentioned evidence of deficiencies in facilities and equipment (Bolin, 2008), regarding presence or adequacy of radiographs; Wetterhall *et al* (2010), regarding 6 of 39 items relating to sterilisation, plus some equipment deficiencies. Quality of evidence: moderate/strong in 2 of 2 studies.

No studies were found which have specifically examined safety issues and **dental nurses** or **dental assistants** under direct access arrangements. However there is evidence that the deployment of Extended Duties Dental Nurses (EDDNs) in the Scottish Government 'Childsmile' programme (Macpherson *et al*, 2010; Turner *et al*, 2010) has not compromised patient safety. No significant adverse events have been recorded in over 168,000 fluoride varnish applications completed by the EDDNs in nursery and primary schools without the presence of a dentist. At the same time, access to care has been improved as a result of EDDNs identifying and referring

thousands of children with dental problems to their dentist (personal communication, Childsmile Central Evaluation and Research Team, Glasgow Dental School, June 2012).

(ii) Risks relating to diagnosis and referral decision-making

Eleven studies looked at the quality of DCPs' diagnosis and referral decision-making. Four (Wang, 2011, Kwan *et al*, 1998, Simmer-Beck *et al,* 2011, Brockenhurst *et al*, 2012) found evidence of poor specificity (i.e. referring a significant number of non-problematic cases), leading to unnecessary consultations. However Hawley *et al* (1999) reported under-referral. Hopcraft et al (2011) noted good referral agreement between DCP and dentist, but Metz *et al* (2011) noted problems in getting dentists to accept referrals. Perry *et al* (1997) reported good uptake of referrals by adult patients, while Simmer-Beck *et al* (2011) reported a low uptake of referrals from a school dental service.

Lopez-Jornet *et al* (2006) and Nicoleta *et al* (2004) found knowledge and training deficiencies regarding oral cancer detection among dental hygienists, while Turner *et al* (2011) report a lack of confidence amongst hygienists' and therapists in their own ability to detect possible oral cancer. None of these three studies compared DCPs' knowledge with that of dentists.

Quality of evidence: moderate/strong in 10 of 11 studies.

(iii) Support to patients. Seven studies looked at aspects of DCPs' knowledge or support to patients regarding smoking cessation (Brothwell *et al* (2008), Chambers *et al* (1996), Lopez-Jornet *et a*l (2006), Nicolera *et al* (2004), diabetes (Boyd *et al* (2008)), child abuse (Chadwick *et al* (2009)) and domestic violence (Mascarenas et al (2009). All but Brothwell *et al* found deficiencies in DCPs' knowledge or support to patients, but there is no evidence from these studies to suggest that dentists were any better in these respects. Quality of evidence: moderate/strong in 5 of 7 studies.

Other factors

(i) More effective use of scarce resources (i.e. dentists' time)

The evidence for savings in dentists' time or other resources was all US-based (Perry *et al* (1997), Baillit *et al* (2008), Mitchell *et al* (2006)), and inconclusive. Of course, if access to dental care is widened, and appropriate referrals made for dentists, demands on that level of service may rise. Quality of evidence: moderate in 1 of 3 studies.

(ii) Higher Job satisfaction among Dental Therapists and Hygienists

There is evidence from two studies (Metz *et al* (2011), Turner *et al* (2011)) that DCPs' job satisfaction is higher when they work to their full remit and training. Quality of evidence: moderate in 2 of 2 studies.

(iii) **Concerns and lack of knowledge of professionals and patients regarding direct access.**

Both dentists and patients in several studies have shown mixed views about DCPs providing treatment. Patients of DCPs have reported different views (see (ii) above). (Hopcraft et al, (2008), Abelsen et al (2008), Turner et al, (2011), Dyer et al (2008, 2009). Quality of evidence: moderate in 5 of 5 studies.

Challenges/mitigation of risk

Potential barriers to direct access identified through the direct access literature search relate to practitioner and patient attitudes towards an extended DCP role. Attitudes among both dentists and patients tended to be more positive with direct experience of working with or being treated by DCPs, and DCPs themselves were confident in their abilities to work more independently (Hopcraft (2000), Abelsen (2008), Turner (2011), Dyer (2008, 2009). Five approaches to the mitigation of risk were identified: limitations of clinical remit, patient groups or settings, stipulated levels of experience, qualification or training, formal supervision by dentists, audit and inspection arrangements, and line management structure.

There is little evidence to evaluate or compare these approaches.

Our secondary review of direct access in the non dental health literature was used to provide supporting evidence on the most important of the issues listed above *i.e.* patient safety and risks relating to diagnosis and referral decision-making. Evidence from eight primary care nursing studies reviewed is favourable, in that six (Gardner *et al* (2005); Everett *et al* (2009); Coulthard *et al* (2003); Myers *et al* (1997); Offerdy (2002); and Lattimer *et* al (1998)) found no evidence that patient safety was compromised. The systematic review by Laurante *et al* (2009) also reports no impact on health outcomes, but cautions about study quality. Only one study (Moll van Charante *et al* (2006)) found potential safety issues in terms of the considerable variation among nurses making telephone based assessments and referral decisions.

Eight physiotherapy studies reviewed (Ferguson *et al* (1999); Mackay (2009); Mitchell (1997); Moore *et al* (2005a; 2005b) Shoemaker et al (2012); Daker-White *et al* (1999); Childs *et al* (2005)) found no risk to public safety, while six others were either inconclusive (Leemrijse *et al* (2008); Foster *et al* (2011); Hattam (2004)) or at least partially negative (Jette *et al* (2006); Riddle *et al* (2004); Schmid *et al* (2008)). Relevant training to improve assessment and referral skills was recommended. The findings from the two audiology studies reviewed (Zapala *et al* (2010); Swan *et al* (1994) were very positive about patient safety and direct access to such services.

A Cochrane systematic review of evidence about extended roles for allied health professionals (McPherson *et al* (2006)) was inconclusive on patient health outcomes due to lack of evidence.

Background

Context to the Review

Current GDC regulations require a patient seeking dental treatment to first see a dentist, who may or may not then refer the patient on for treatment by a DCP. Direct access would mean giving patients the option to see a DCP without having seen a dentist first. DCPs in the UK context include (in descending order of numerical size) dental nurses, dental hygienists, dental therapists (usually holding a dual therapy-hygiene qualification), dental technicians, clinical dental technicians, and orthodontic therapists. Together these groups make up over 60% of the dental workforce, with dentists making up the remainder. There is a well established trend for both pre and post qualification DCP training to become more intensive and extensive in terms of clinical remit, skills of disease recognition and referral.

In some countries, direct access is legal for dental hygienists and, perhaps more controversially, for dental therapists, who are trained to perform a considerable range of restorative treatment otherwise completed by dentists. In the UK, professional associations such as the British Society of Dental Hygiene and Therapy and the Dental Technologists Association, have called for patients to have direct access to their members' services without requiring a dentist referral.

In May 2012 the Office of Fair Trading (OFT) published a report on Dentistry in the UK (Dentistry, OFT1414: www.oft.gov.uk.). This report includes a chapter on direct access in the dental market (pages 90-107); which argues for deregulation regarding the requirement that patient access to DCP services must be through a registered dentist. The OFT's position is that the current arrangements represent an unjustified limitation of trade, and that it would be in the patient's interest to de-restrict the dental market. The OFT report cited a number of sources as evidence for their conclusions. Two of these sources are research studies also included in this Report (Brockenhurst *et al*, 2012; Hopcraft *et al*, 2005). The review by Galloway *et al* (2003) is also referenced here.

Much of the material in the OFT report relates to the issue of the ability of DCPs to screen for problems requiring referral to a dentist. A number of other studies on this issue are included in this review but not in the OFT report (see study summaries of Metz *et al* (2011), Wang (2011), Kwan *et al* (1998), Simmer-Beck *et al* (2011), Brockenhurst *et al* (2012), Hawley *et al* (1999), Hopcraft et al (2011)). Other sources quoted by OFT were expert opinion from both dental and medical academics, information from organisations in the UK and abroad, and the outcome of roundtable discussions and interviews. The selection and outcomes of these consultations appear well considered and comprehensive. However, given the brief which this

current report follows, such non-empirical study based sources are not included or reported here.

In late April 2012 The General Dental Council (GDC) commissioned the rapid evidence review reported here regarding the likely impact (including benefits and risks) of allowing patients direct access to treatment by dental care professionals (DCPs). The review was commissioned in order to inform the GDC about whether any expansion of direct access would involve increased risk to patients, either by treatment or through failure to recognise and refer problems outside their clinical remit. It is not the intention of the authors of this rapid literature review to make any clearly formulated recommendations. Rather, the intention is for the results of this review to help inform the GDC's Direct Access Task and Finish Group and thus provide them with an increased ability to themselves make recommendations to Council on this issue.

Review Aims and Research Questions

The aim of this rapid literature review was to establish, review and summarise evidence on direct access so that the Task and Finish Group can assess the likely benefits and risks of introducing direct access into dentistry in the United Kingdom. Currently the only member of the dental team who can see patients directly is the dentist, who may then refer the patient to other members of the dental team for some or all of the treatment to be carried out. Direct access would mean allowing patients to see a DCP without having seen a dentist first. Clinical Dental Technicians is the only current exception to this arrangement.

The study reviews relevant empirical literature to:

A. establish what evidence is available:
   i. **where** there is some level of direct access to dental treatment by dental care professionals (both in the UK and in other countries);
   ii. **where** direct access has been introduced for healthcare professionals in the U.K. for example physiotherapists and nurse practitioners;
   iii. **where** direct access has been introduced for other regulated professions.

B. ascertain what **evidence** these studies contain about the **impact** of direct access including **models** adopted, **risks and benefits** to patients/clients (including patient protection) and any **other impacts** e.g. on attendance, patient/client attitude or the attitudes of other affected healthcare professionals;

C. ascertain what **challenges** the introduction of direct access has presented, how relevant these are to dentistry and any evidence of these challenges being managed and **risks mitigated**.

D. highlight any **gaps** in the evidence

Specific research questions addressed by the Review

A. Extent of direct access

- To what extent does direct access to dentistry exist outside the U.K?
- What and where are the various models?
- Is there evidence that direct access to dentistry is being used in the UK to the limited extent to which it is currently allowed?
- To what extent does direct access to other forms of regulated healthcare exist in the U.K and elsewhere?
- To what extent does direct access to other regulated professions exist?

B. Impacts, including risks and benefits

- What factors emerge as the major impacts, including risks and benefits, of introducing direct access?
- What evidence was found for these factors?
- Is there any evidence to show that risks to patients/clients have been increased by the introduction of direct access?
- Is there any evidence to show that patients/clients benefit from the introduction of direct access?

C. Challenges/mitigation of risk

- What challenges emerge from the literature in relation to the introduction of direct access and what evidence is there of successful management of those challenges?
- How has risk been mitigated (e.g. additional training, supervision)
- Is there any evidence that a particular model has been introduced more successfully than others? Criteria for 'success' might be factors such as patient safety, patient satisfaction, improved numbers of patients attending for treatment, positive reaction by other members of the dental team.

D. Quality of evidence

- How robust and credible is this piece of evidence and what conclusions can be drawn from it?

Methodology

This rapid literature review (conducted in a 10 week period between late April and the end of June 2012) has involved searching for studies evaluating or describing direct access arrangements or issues pertinent to such arrangements. Searches have been comprehensive and cover both dental and other heath-care fields. Extensive enquiries have been made to dental organisations worldwide. However, it should be noted that as a rapid evidence review, it does not claim to be an exhaustive selection and grading of the relevant literature. This is particularly true with regard to grey literature and to papers published in journals which allow restricted access to full text articles through the internet databases available to the team. With the GDC's agreement, searches were restricted to post 1993, the year of the Nuffield Report publication. Inevitably this potentially excluded useful data, particularly regarding non-dental health care direct access studies.

Search Strategy and Sources

We searched 8 online sources of published literature (Medline, CinAHL, PsycINFO, SCI, SSCI, Cochrane Database of Systematic Reviews, Business Source Premier, Google scholar), representing a wide range of disciplines and journal types. A systematic search strategy was devised and refined through an iterative process. Several keywords and free text terms were used according to the following broad search architecture (see Table 1 for examples of search terms and Table 2 for a specific example of a search string devised and used in the Medline, CinAHL and PsycINFO via the Ebsco Host platform):

1. Dental/dental health professionals related terms and their synonyms
2. Direct access and synonyms
3. 1 AND 2
4. no limits applied in the first instance

Table 1. Search terms used

Access synonyms	Dental professions	Health professions	Other professions
“direct access” “direct patient access” Access* Autonom* Independen* “independent pract*” Skill-mix “workforce planning” Prescription Complementary “role substitution” "general supervision" "remote supervision" “indirect supervision” Supervision "Unsupervised Practice" "Less Restrictive Supervision"	Dental “oral health” “dental therapist” “dental hygienist” “dental hygienist” “dental technician” “dental nurse” “extended duties dental nurse” “clinical dental technician” “denturis* “dental care professionals” “dental hygienist-therapist” “dental assistant” DCP “Profession* allied to dentistry” “advanced dental therapist" "Advanced Dental Hygiene Practitioner" ADHP "Advanced dental hygienist" “mid-level” “orthodontic therapist”	Nurse “Nurse practitioner” “Practice nurse” Physiotherap* “physical therap*” Pharmac* “Mental health worker*” “Dispensing optician” Audiolog* Opthalmol* Optomotr* orthoptist* Midwife* "certified nurse midwife" "clinical nurse specialist" "certified registered nurse anesthetist" "certified registered nurse anaesthetist" “occupational therapist” “speech and language therap*	Law Legal Counsel* “social work” Advice Advis* Selected other professions providing human services

***Table 2: Example of actual search string run (Search: Dental/related AND direct access) run in Ebsco*:**

Direct access search with limits of Medline+; CinAHL; PsycINFO. 4th May 2012

#	Query	Results
S21	**Limit S20 to English language with abstracts and deduplicate**	**1623**
S20	S12 and S19	4446
S19	**S13 or S14 or S15 or S16 or S17 or S18**	**148073**
S18	MM "Self Referral"	114
S17	self referral	1898
S16	(MM "Referral and Consultation") OR "self referral"	24634
S15	(MH "Health Services Accessibility") OR "direct access"	85488
S14	"self referral" OR (MH "Referral and Consultation")	65688
S13	(MH "Direct Access") OR (MH "Health Services Accessibility")	83074
S12	**S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11**	**79939**
S11	TX dental technician*	3567
S10	TX profession* n1 allied n2 dent*	164
S9	TX extended duties dent*	2
S8	(MH "Dental Assistants") OR "dental nurse"	5026
S7	(MH "Dental Health Services+") OR (MH "Health Education, Dental")	40762
S6	(MH "Dental Health Services+") OR (MH "Dental Hygiene Assessment") OR (MH "Dental Hygienist Attitudes") OR (MH "Dental Health Education")	36524
S5	MM "Dental Health"	114
S4	(DE "Oral Health") OR (MM "Oral Health")	12771
S3	(MH "Oral Health") OR (MH "Oral Hygiene+")	28027
S2	dental auxiliary* or dental hygienist* or dental assistant* or dental technician* or dental therap* or allied dental personnel or dental ancilliary or oral health therapist	18136
S1	MH Dental Hygienists OR MH Dental Auxiliaries+ OR MH Dental Assistants OR MH Dental Technicians	17086

ENDNOTE X4 was used to record, organise and edit retrieved citations. In order to further augment the core search, hand-searching of key dental journals was conducted by the study team. The team also made efforts to contact:

- Educational institutions running dental hygiene/therapy and dental nurse training to identify aspects relevant to any extension of direct access to these practitioners.
- DCP professional associations in the UK and in countries where direct access has been instigated. For example, each US State has different arrangements regarding direct access to dental hygienists.

- Relevant bodies in other professions where direct access has been established, for example regarding nurse practitioners in the UK.

The reference lists of studies included in the review were scrutinised for any pertinent studies.

Study Selection Criteria.

Publications found by the above strategies were checked independently by two team members, and a decision made as to their inclusion in the final review using the following criteria.

Table 3. Inclusion and exclusion criteria

INCLUSION CRITERIA	• Likely to include data pertinent to direct access as defined above. • Likely to report empirical data relating to the operation of that system, including qualitative assessments. • Reports primary or secondary (i.e. review) data. • Is accessible in English.
EXCLUSION CRITERIA	• Papers relating to non UK countries, except in the case of direct access in dental care. • Papers published pre-1993 (*i.e.* prior to *The Nuffield Report*).

Three Stage Study Selection Process

The initial screening stage resulted in a shortlist of articles including titles and abstracts. In the second stage, eligibility assessment was performed independently by two reviewers (STu & STr). Disagreements between the two reviewers were resolved by consultation with the third reviewer (SM). The third stage involved retrieval of the eligible articles in full text. Final selection of the studies to be included in the review was further assessed and discussed within the team until consensus was reached.

Data Collection (Extraction) Process

One reviewer (STu) extracted data from the included studies and a second reviewer (STr) checked the extracted data. Disagreements were resolved by discussion with the third reviewer (SM).

Assessment of methodological quality

Since this was a rapid evidence synthesis which included a large number of different types of publications/studies, we set out to selectively assess methodological quality. We assessed

the quality of those studies reporting data pertinent to understanding the benefits and risks of direct access to dental care practitioners. We also assessed the quality of studies regarding direct access in allied health professionals where they presented data relevant to issues of patient safety, including treatment and referral quality. We adopted the following methods to assess the quality of such studies.

Assessing quantitative studies

Methodological quality was measured by reference to checklists developed by CASP (www.casp-uk.net/) or SIGN (www.sign.ac.uk/methodology/checklists.html).

The checklist most commonly used in this review covered observational studies, shown in Figure 1.

Figure 1: CASP checklist: observational studies

Paper citation:

A/ What is this paper about?

	Yes	Can't tell	No
1. Is the study relevant to the needs of the Project?			
2. Does the paper address a clearly focused issue?			
in terms of ...			
• The population studied?			
• (case-control study only) Is the case definition explicit and confirmed?			
• The outcomes considered?			
• Are the aims of the investigation clearly stated?			
3. Is the choice of study method appropriate?			
4. Is the population studied appropriate?			
• (x-sec study) Was the sample representative of its target population?			
• (cohort study) Was an appropriate control group used – ie were groups comparable on important confounding factors?			
• (case-control study) Were the controls randomly selected from the same population as the cases?			
5. Is confounding and bias considered?			
• Have all possible explanations of the effects been considered?			
• (cohort study) Were the assessors blind to the different groups?			
• (cohort study) Could selective drop out explain the effect?			
• (x-sec study) Did the study achieve a good response rate?			
• (x-sec study) Were rigorous processes used to develop the questions? (e.g. were the questions piloted/validated?)			
• (case-control study) How comparable are the cases and controls with respect to potential confounding factors?			
• (case-control study) Were interventions and other exposures Assessed in the same way for cases and controls?			
6. (Cohort study) Was follow up for long enough?			
• Could all likely effects have appeared in the time scale?			
• Could the effect be transitory?			
• Was follow up sufficiently complete?			
• Was dose response demonstrated?			

C/ What did they find?

	Yes	Can't tell	No
7. Are tables/graphs adequately labelled and understandable?			
8. Are you confident with the authors' choice and use of statistical methods, if employed?			
9. What are the results of this piece of research? *Please note to avoid duplication with audit forms this section will not be completed*			

D/ Are the results relevant locally?

	Yes	Can't tell	No
10. Can the results be applied to the local situation? Consider differences between the local and study populations (eg cultural, geographical, ethical) which could affect the relevance of the study.			
11. Were all important outcomes/results considered?			
12. Is any cost-information provided?			
13. Accept for further use as Type IV evidence?			

Comments:

The use of such tools ensures the extraction of pertinent data to allow an appraisal of the overall methodological quality of individual quantitative studies. Using the extracted data, quantitative studies were assessed as falling into one of four categories of overall

methodological quality: very poor, poor, moderate and good. The level of evidence relating to quantitative studies selected for inclusion was measured as follows:

Level I

systematic review (or meta-analysis) of all relevant randomised controlled trials.

Level II

randomised controlled trial.

Level III

- pseudo-randomised controlled trials (alternate allocation or some other method).
- comparative studies (including systematic reviews of such studies) with concurrent controls and allocation not randomised, cohort studies, case control studies or interrupted time series with a control group.
- comparative studies with historical control, two or more single-arm studies or interrupted time series without a parallel control group.

Level IV

case series, either post-test or pretest/post-test, non-comparative studies.

In the results section of this report, where evidence from individual quantitative studies is being presented which pertain to benefits and risks, a summary of the type of study, level of evidence, and study quality is provided in parenthesis; e.g. (comparative study, evidence level: III-2; study quality: good)

Assessing qualitative studies

Qualitative studies set out to answer different types of question from quantitative studies, and it is therefore not appropriate to grade them alongside quantitative studies. We therefore simply assessed their methodological quality. Assessing the methodological quality of qualitative studies using composite scales however, has been hotly debated and contested. We therefore performed a global assessment of study quality, according to whether it appears to be strong, moderate or weak. Strong studies are likely to include triangulation of data, respondent validation, and evidence of data saturation, clear exposition of methods of data collection and analysis, and reflexivity. We also considered the nature of the evidence reported in the qualitative studies and assessed these in terms of the “typologies” of their findings as described by Sandelowski & Barroso. According to Sandelowski, the findings of

qualitative studies in the health domain can be classified on a continuum of increasing data transformation from findings that are not qualitative (no finding, topical survey), to ones that are exploratory (thematic survey), descriptive (conceptual/thematic description), or explanatory (interpretive explanation).

In the results section of this report, where any evidence being reported is from a qualitative study this is clearly shown and an indication given in parenthesis as to whether the methodological quality is weak, moderate or strong; e.g. (qualitative. weak)

Review of literature and evidence that address the research questions

Figure 2 shows the timeline for the review.

Figure 2: Gantt chart of review process

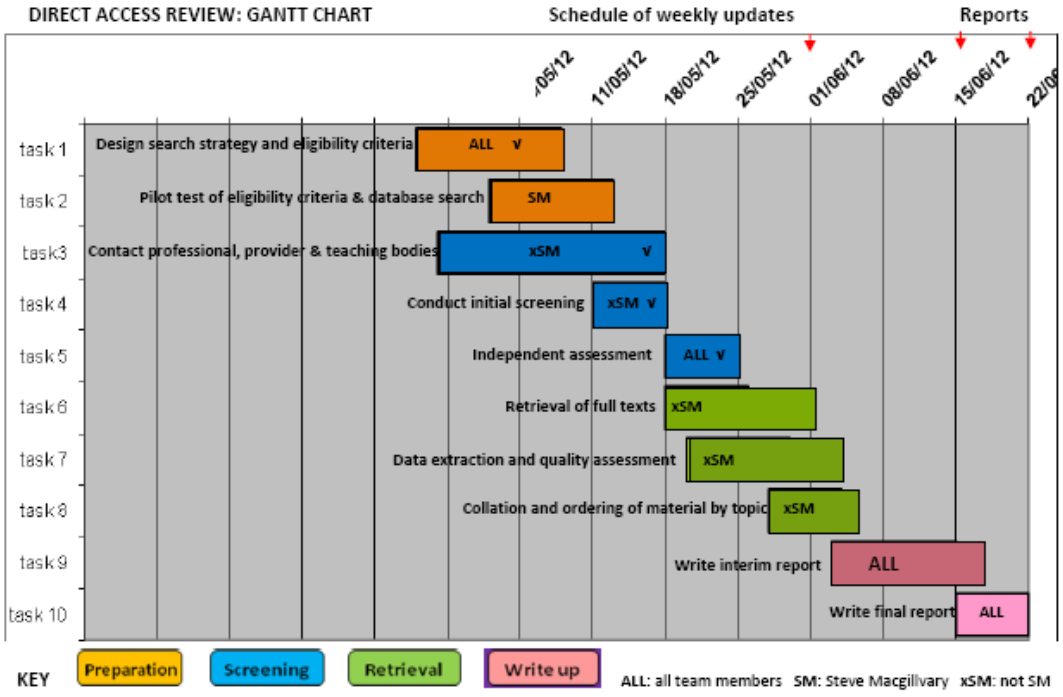
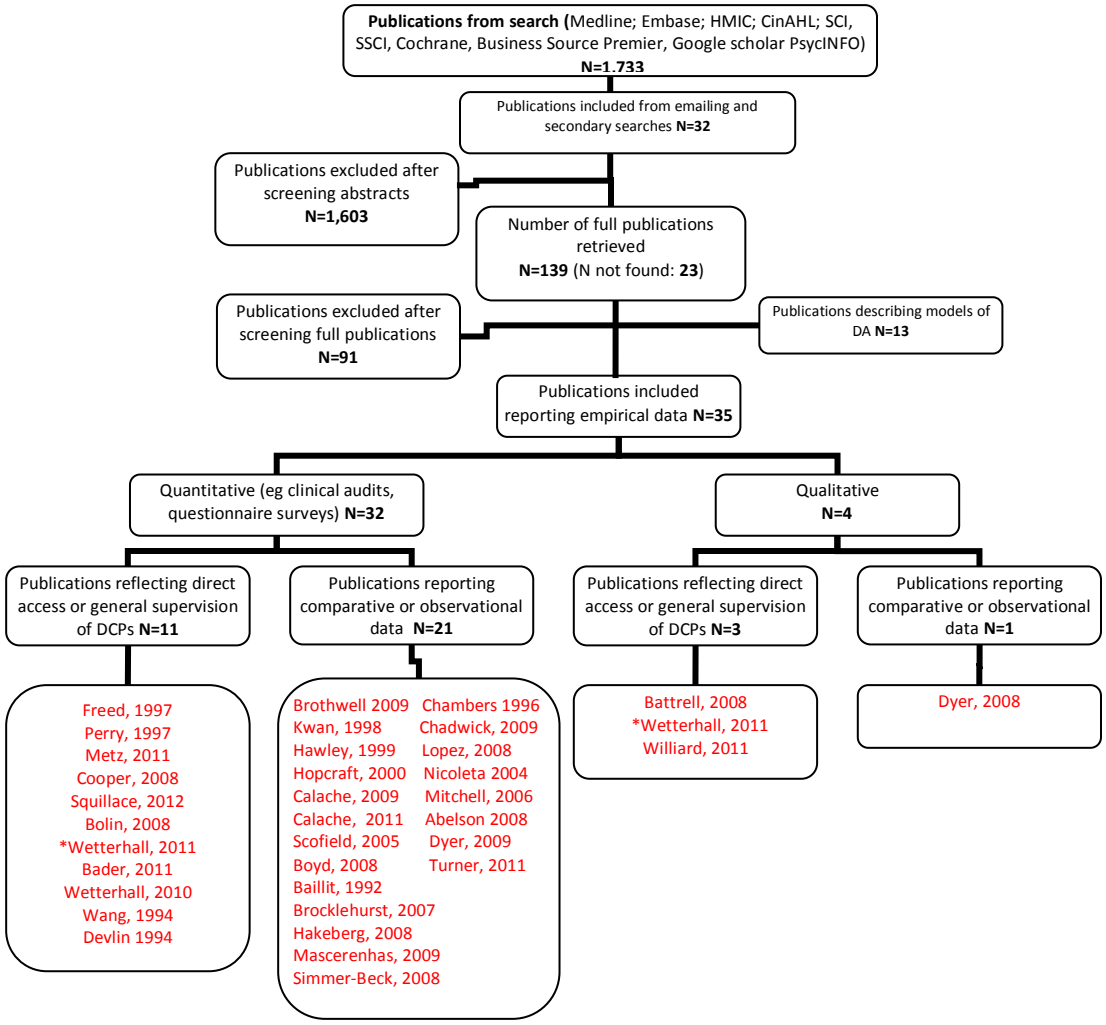


Figure 3 shows the process of evidence identification and appraisal for the dental papers. 139 full text papers were retrieved and accessed for relevance. Of those, 35 were judged to have empirical evidence of sufficient relevance and quality for inclusion. These papers were then evaluated for quality using the appropriate CASP/SIGN checklists and the levels of evidence typology. The level of evidence ranged from Level III-2 to level IV.

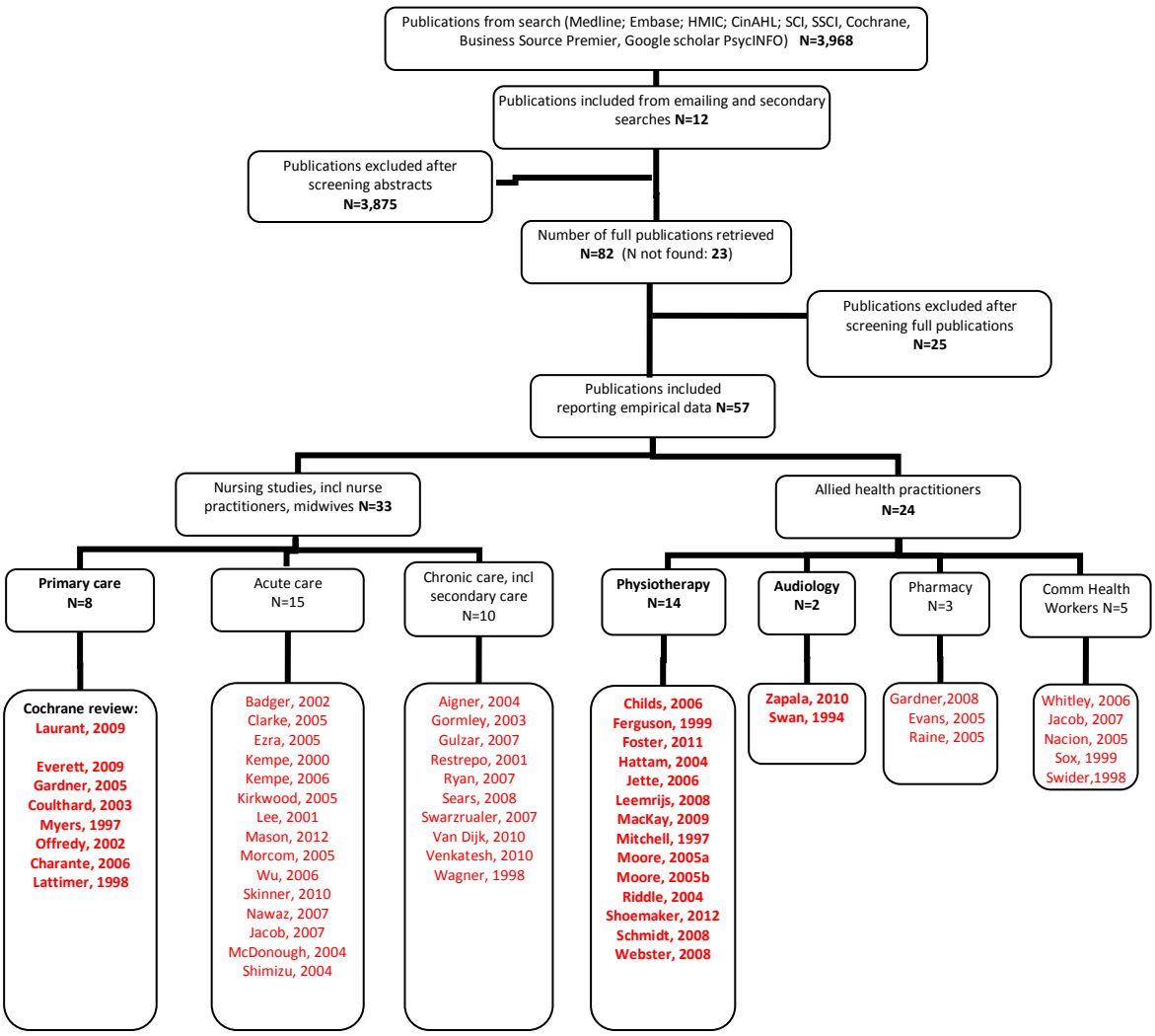
A second search was then conducting to identify non-dental health-related papers which may contain evidence about the impact of direct access, including models adopted, risks and benefits to patients/clients and any other impacts e.g. on attendance, patient/client attitude or the attitudes of other affected healthcare professionals. Figure 4 shows the results of these searches.

Figure 3: Flow chart of publications included from search of dental health care direct access literature



*Wetterhall, 2011 is included as both quantitative and qualitative

Figure 4: Flow chart of publications included from search of non-dental health care direct access literature



Papers in bold are reported in this review.

Results

Results pertaining to each research question:

A. Extent of direct access

a) To what extent does direct access to dentistry exist outside the U.K?

b) What and where are the various models?

Dental therapists.

In some countries, therapists may practice independently without dentist supervision. In others, they may work independently, but with a collaborative/ consultative relationship with a dentist. Nash *et al* (2012) list 54 countries and territories that employ dental therapists in some form, including five of the top six countries on the Human Development Index (Australia, Netherlands, United States, New Zealand and Canada). Other countries employing dental therapists are Hong Kong, Singapore, United Kingdom, Brunei and Barbados, and most Commonwealth countries. They point out that most countries limit dental therapists to governmental service, rather than private practice, most commonly in public school-based programmes, supervised by a state-employed dentist, who may or may not be on site. Relevant documentation included in the Appendices to this Report is indicated.

New Zealand

New Zealand pioneered the development of the dental hygienist able to offer restorative treatment without direct supervision from a dentist, and its service has been used as a model for more recent developments elsewhere, for example in Alaska. Traditionally focussed on school setting, recent legislation and registration/ licensure changes have extended the remit of dental therapists to adults, following completion of additional training. They can also now work in private dental practices and may also practice independently, with a consultative agreement with a dentist (Nash et al, 2008). Single hygiene or therapy qualifications have now been replaced by “Oral Health” degrees enabling registration in both dental therapy and dental hygiene (Appendices 1 - 3).

Australia

Nash et al (2012) comment that the overwhelming majority of dental care for children in Australia since the 1970s has been provided by dental therapists alone, without on-site dentist supervision. However, that report also reviews evidence that there are considerable differences in dental therapist practice between States. In Western Australia, dental therapists were reported to have little training in interpreting radiographs and to generally take radiographs on prescription of dentists and to make treatment decisions arising from this on

their advice. In Queensland dental therapists practiced under similar regulations, while in Victoria dental therapists were trained to autonomously prescribe, expose and interpret intra-oral radiographs.

The Netherlands

Although the term Dental Hygienist is used in Holland, their clinical remit is akin to a dually-qualified hygienist therapist in the UK. Training takes four years to degree level. Since 2000 dental hygienists are registered along with other paramedics with the Quality Register for Paramedics. They may practice with considerable autonomy. In 2006 direct access to dental hygienists became legal, and their clinical remit extended to restorative treatment and screening of dental or other oral health defects. Dental hygienists may treat primary caries and administer local anaesthesia without surveillance by or intervention from a dentist. For activities beyond their scope of practice, the dental hygienist refers to a dentist or physician (source: Dutch Society of Dental Hygienists in The Netherlands (2007) Professional Profile Dental Hygienist in The Netherlands, p20 (Appendix 1).

US

Recognition of the chronic shortage of dental services and high need among rural and remote communities led the Alaska Native Tribal Health Consortium to introduce a new 'mid-level' practitioner, the Dental Health Aide Therapist (DHAT) in 2003. These therapists were originally New Zealand-trained, and were located in remote and underserved tribal villages to care for Alaska Natives, acting under general supervision of a named dentist. Their scope of practice permits a range of restorative treatments without direct supervision of a dentist. (Appendices 1 and 2).

In 2009, Minnesota became the first state to pass legislation creating two new types of oral health practitioners, a dental therapist and an advanced dental therapist. The dental therapist (DT) concept is modelled after the physician's assistant model which requires on-site supervision for most services provided. The advanced dental therapist (ADT) is modelled after the nurse practitioner model and is designed to facilitate collaboration between the ADT and dentist, but does not require on-site supervision. The ADT can provide preventive, therapeutic, diagnostic, prescriptive, and minimally invasive restorative services directly to the underserved, bringing care to patients disenfranchised from the current oral health care system. The first Minnesota ADTs came into practice in 2011 (Appendices 1, 2 and 4).

Dental hygienists.

US

In US States dental hygienists can follow an unsupervised practice model, i.e. initiate treatment based on his or her assessment of patient's needs without the specific authorisation of a dentist, treat the patient without the presence of a dentist, and maintain a provider-patient relationship. This situation applies in 14 of the US States, including California, Minnesota, New Mexico, Oregon, Colorado, and Washington. In Minnesota the advanced dental hygiene practitioner (ADHP) programme at the Metropolitan State University produced its first graduates in 2011 (Appendices 1 and 2).

Four States specifically authorise hygienists to own their own dental hygiene practice - Colorado, Maine, New Mexico and California. Colorado has been a pioneer State in this respect, obtaining unsupervised practice for almost all dental hygiene services in 1986, and specific statutory authorisation to open their own dental hygiene offices and to own a dental hygiene practice. Colorado remains the State with the least supervision and business restrictions. By July 2012 Maine had about 40 independent practice dental hygienists, with new powers to take X-rays and own radiograph equipment. In New Mexico, dental hygienists may work under "collaborative practice"--that is, by consulting dentists. These aided practices serve 4,000 patients.

California's Registered Dental Hygienists in Alternative Practice (RDHAP) may practice unsupervised and own their business under similar regulations that operate in Colorado. The RDHAP must have a documented relationship with a dentist to whom they refer patients for needed follow-up. Every 18 to 24 months, the patient must have a referral from a dentist or physician that allows the RDHAP to continue to provide dental hygiene services (Appendix 2).

In addition, Washington State hygienists have been authorized to practice without supervision of a dentist in settings limited to nursing homes and similar facilities sine the 1980s. While there are no statutory regulations which specifically refer to owning a hygiene practice or business in that State, a number of hygienists do practice exclusively with nursing home patients and have formed a dental hygiene business.

The Virginia Pilot Project seeks to assess the impact dental hygienists practicing in an expanded capacity under remote supervision have on increasing access to dental health care in three underserved rural populations. The dental hygienist refers patients without a dental provider to a dentist. Their permitted duties are: prophylaxis; X-rays; topical anaesthesia;

fluoride; pit/fissure sealants; root planing; study cast impressions; place and remove perio dressings; remove sutures. Hygienists in the programme must be employed by the Department of Health and have a minimum of two years experience (Appendices 1 and 2).

Table 4 gives an overview of dental hygienist terminology relevant to US practice.

Table 4. US dental direct access models terminology (dental hygienists (dh))

adapted from Emmerling H (2011) (see Appendix 12), and ADHA's "Direct Access States" April 2010.

- **Advanced dental hygiene practitioner (ADHP):** mid-level provider for services from dental hygiene care to simple restorations and extractions without the direct supervision of a dentist.
- **Affiliated practice agreement:** The DH has an agreement with a consulting dentist and provides services according to protocols established in that agreement to patients enrolled in a federal, state, county, or local health program, or who have income below twice the poverty level. Arizona
- **Collaborative agreement/practice:** provision of education, assessment, preventive, clinical, and other therapeutic services in a cooperative working relationship with a consulting dentist, but without general supervision; a formal written document that outlines the professional practice relationship between a licensed DH and a dentist. Alaska, Minnesota, New Mexico
- **Direct access:** treatment initiated based on own assessment of a patient's need without the specific authorisation or presence of a dentist, and can maintain a provider-patient relationship. ADHA has identified 32 states as being direct access states
- **Extended access endorsement/agreement:** Hygienists can provide services in hospitals, long-term care facilities, public health facilities, health or migrant clinics, or other board approved settings if the dentist affiliated with the setting authorizes them. Idaho
- **Extended care:** May practice without the prior authorisation of a dentist if the hygienist has an agreement with sponsoring dentist to act as practice monitor. Settings are mainly educational, health or care facilities. Hygienists must have 1,200 minimum clinical hours or two years of teaching within last three years, plus liability insurance and must be paid by the dentist or facility. Can provide prophylaxis, fluoride treatments, dental hygiene instruction, assessment of the patient's need for further treatment by a dentist, and other services if delegated by the sponsoring dentist. Kansas
- **General supervision:** Dentist must diagnose and authorise the work to be performed by the dental staff but is not required to be on the premises while the treatment is carried out. New York, Oklahoma, Rhode Island, South Carolina, Texas, Vermont
- **Independent practice:** DH may practice without supervision by a dentist to the extent permitted by statute and may be the proprietor of a place where independent practice dental hygiene is performed. Maine
- **Limited access permit:** A DH who renders services to patients who have limited access to regular dental hygiene services (homebound adults, students, Job Corps Women, Infants and Children Program enrollees, patients in hospitals, etc. Montana, Oregon
- **Mid-level provider:** a clinical professional who provides patient care supervised by a dentist or physician. Medical models include nurse practitioners, physician assistants. Can examine, diagnose and provide some treatments, all signed off by a supervising licensed dentist/physician. Mid-levels have a minimum of a bachelor's degree and most have also completed graduate or master's level education.
- **Oral health access supervision (OHAS):** allows practice in public health settings under a written agreement with a dentist with a permit that states the dentist has evaluated the DH's skills and the patient's health history. The dentist need not be present or examine the patient first, but must perform a clinical evaluation before the DH provides subsequent care, possibly by electronic communication. Requires at least 3,000 hours clinical experience; 24 continuing education credits in two years prior to applying for the OHAS permit. Provides prophylactic, preventive, and other procedures a dentist can delegate to a DH, except definitive root planing, definitive subgingival curettage, administration of local anaesthesia, and other procedures specified by the board. Ohio
- **Public health DH:** Under general supervision, the DH performs technical and consultative dental and health educational services as a part of a statewide preventive dental health program. Connecticut, Iowa, Maine, Massachusetts, Michigan, Missouri, Montana, Nebraska, New Hampshire, Nevada, Pennsylvania, Washington, West Virginia, Wisconsin
- **Registered DH in alternative practice (RDHAP):** Unsupervised services for homebound persons or at schools, residential facilities, institutions, and in dental health professional shortage areas. Can offer a patient care for up to 18 months and provide additional care if the patient obtains a prescription from a dentist or physician. Requires a bachelor's degree, 3 years clinical experience, completion of additional 150hours in designated courses, and pass exam. RDHAP must prove an existing relationship with at least one dentist for referral, consultation, and emergency services. Remit is all services permitted under general supervision, including prophylaxis, root planing, pit and fissure sealants, charting, and examination of soft tissue. California
- **Remote supervision:** A Virginia pilot project, hygienists may treat patients in the dental health professional shortage areas and refer patients without a dental provider to a dentist with the goal of establishing a dental home. Hygienists must enter into a remote supervision agreement with a licensed dentist and maintain regular, periodic communication (14 day intervals) with the licensed dentist (protocol must be submitted to the department of health). Two years of experience required and must be employed by the Department of Health. Virginia
- **Unsupervised practice:** No requirement that a dentist must authorize or supervise most dental hygiene services. DHs may also own a dental hygiene practice. The services provided include dental hygiene diagnosis, radiographs, remove deposits, curettage (without anaesthesia), and apply topical anaesthesia. Direct Medicaid reimbursement allowed. Colorado, Washington .

Canada

Each Province of Canada has its own Licensing Authority and slightly different regulations regarding the working practices of dental hygienists. Dental hygienists in British Columbia, Ontario and Alberta are able to open their own private clinics and practice without a dentist on staff. In BC the hygienist cannot provide treatment without the patient receiving a dental exam in the previous 365 days unless the practicing hygienist has an extended duty module (resident-care module). According to the Alberta Health Professions Act 2006 dental hygienists can assess, diagnose, plan, implement and evaluate dental hygiene care to help prevent oral disease such as cavities and periodontal disease, working independently or as part of health care teams. In Oregon dental hygienists may practice with no or little supervision in various types of settings outside the dental office.

In Calgary, dental hygienists offer mobile services by visiting offices and homes to provide dental hygiene services, and run independent dental hygiene centres. Most work very closely with a dentist, and are required by law to seek advice and refer when required. In Saskatchewan dental assistants, dental hygienists and dental therapists do not work under supervision, but do not have complete independence (Appendices 1 - 4).

Australia

Dental hygiene is a relatively new profession in Australia, only being legal in all States by 2001. As a consequence, dental therapists were the more numerous and widespread complimentary dental profession in Australia, although limited to the public sector until 2000.

Norway

In Norway delegation of dental examination to hygienists under the indirect supervision of a dentist is current permitted.

This historical move towards greater independence and direct access appears to have been in one direction. We made specific enquiries to Associations in Canada and the US on whether any restrictions had been re-introduced. Apart from much earlier developments in California which encountered legal and funding problems, in neither country has deregulating legislation been rolled back.

c) Is there evidence that direct access to dentistry is being used in the UK to the limited extent to which it is currently allowed?

Two papers describe models of direct access in the UK relating to dental nurses (Macpherson et al, 2010; Turner et al, 2010). These papers include details of the role of Extended Duties Dental Nurses (EDDNs) in the Childsmile National Child Oral Health Improvement Programme funded by the Scottish Government since 2005. The GDC's Scope of Practice document (April 2009) extended the duties that a dental nurse can train to undertake. Those specifically utilised in the Childsmile programme under general supervision are: further skills in oral health education and oral health promotion, and applying fluoride varnish as part of a programme overseen by a consultant in dental public health or a registered specialist in dental public health. Similar functions are performed in the *Designed to Smile Preventative Programme* in North Wales.

The Dental Technologists Association made their submission to the GDC available to the Review team (DTA, 2012). The DTA argues that advances in technology and enhanced restorations mean that there is a need for direct access by patients to Dental Technicians/Technologists. It claims that much direct access to DTs already occurs, but does not submit any data to support their position.

d) *To what extent does direct access to other forms of regulated healthcare exist in the U.K and elsewhere?*

As figure 4 shows, our database search identified six areas of health care where some form of direct access had been reported. The seventh shown, audiology, covers two useful studies but we have been unable to confirm that direct access by the public (as opposed to direct access by primary care physicians, as described in the literature) is currently possible. Of course there may be more areas, but our investigations were constrained by the need to select papers with useful substantive evidence within the time available. Three of the seven areas, and 40 of the 66 identified papers, relate to nurses working under direct access arrangements. This often involved primary care settings - probably the most useful comparison for this report. A Cochrane systematic review on the substitution of doctors by nurses in primary care (Laurant *et al*, 2009), although not explicitly defined as direct access, is also relevant to this review. We also found studies dealing with nurses working in acute hospital based services or in caring for patients with chronic conditions, and a number of cases where midwives and psychiatric nurses worked with direct access.

The areas where our literature search identified direct access in non-dental health services were as follows:

Primary Care and General Practice nursing: US, UK, Australia, Canada, Netherlands. Includes nurse practitioners, midwifery, and primary care telephone triage.

Acute nursing: (hospital based or linked): US, UK, Australia, Japan. Services involved ophalmology and cancer screening, febrile neonates, emergency services, tonsillectomies, and hospital based paediatric call centres.

Chronic nursing: US, UK, Netherlands, South Africa. Services involved elderly care home and domiciliary care, Parkinson's disease patients, genetic screening, rheumatology, chronic pain management, HIV and diabetes care.

Physiotherapy: US, UK, Netherlands, Canada. The literature is mainly US in origin, including two high quality studies based on army provision. Access varies by State: 46 States and Washington DC permit some degree of direct consumer access to physical therapy treatment: 17 have unrestricted direct access, and the other 29 states and Washington DC have various restrictions on access to and receipt of physical therapy treatment (Shoemaker, 2012).

Pharmacy: US; UK.

Audiology: US; UK.

Community Health Workers and paramedics: US; developing countries

e) ***To what extent does direct access to other regulated professions exist?***

We examined three recent reviews which were felt to have potential for at least partly addressing this question. The first (Flood and Whyte, 2008) considered changes in the legal profession which allowed clients direct access to barristers without going through a solicitor. However, as we stated in our tender for the GDC review, this change did not appear to be useful contribution to the direct access to DCPs debate in dentistry (being analogous to direct access to orthodontist or other specialist dentists). Close examination of this source confirmed our original view, and this type of direct access is not discussed further.

The Report *"The Role of the Social Worker in the 21st Century – A Literature Review"* (Scottish Executive, 2005) discusses concerns that social work's unique nature could be lost amid the blurring of professional boundaries and the growth of para-professionals. This term refers to:

"that body of workers who undertake caring roles and work in social care generally but who are not classified or qualified as 'social workers'. In most countries there has been an expansion of the para-professional sector with the concern expressed that much of what is seen to be the core task of social work may in fact increasingly be carried out by para-professionals. The consequence of this is that those qualified social workers may be left to fulfil responsibilities, such as care management and risk assessment, which are one step removed from what they take to be the true role of the social worker The further danger is also of course that the goals set for the social work task are externally defined (the management of care, assessment of risk, fulfilling the management role) rather than being set within the terms of professional judgement and decision making. This changing role for social workers in which they are seen to lose elements of their core tasks may well account for the disillusionment expressed by social workers…" Scottish Executive, 2005, p33

The Report goes on to voice concerns that effective working together can be inhibited by the lack of knowledge of or assumptions made about the responsibilities of one profession by members of another.

To some extent these concerns are mirrored in some of the debate held in dentistry regarding changing clinical roles. Unfortunately the report does not reference any empirical studies on such developments in social work.

A second literature review "*Access to independent advocacy: an evidence review Report for the Office for Disability Issues"* (Townsley et al, 2008) discusses what could be seen as a para-professional role in social work with some relevance to dental team roles and responsibilities. The report defines 'independent advocacy' as

"a partnership between a concerned member of the community (advocate) and a person who may be feeling vulnerable, isolated or disempowered. The advocate provides support, information and representation with the aim of empowering their advocacy partner and enabling them to express their needs and choices. If necessary, the advocate can represent their partner's wishes to another person or agency on their behalf."

(Townsley et al, 2008, p6)

It goes on to identify three important features of this role:

- separation from other forms of direct service provision
- independent governance
- independent funding arrangements (i.e. are not directly public-funded).

It could be argued that the first two of these could apply to direct access to DCP services in dentistry. The review cites limited research evidence for advantages of the independent advocate role in:

- supporting young disabled people at transition in terms of personal development (i.e. increased confidence and self-esteem) and potentially, employment.
- helping vulnerable adults who had been victims of abuse. This showed that in the majority of the cases reviewed the goals of the advocacy were met and the abuse was stopped.
- providing an independent advocacy service in a high-security hospital, in terms of getting rid of anger and increased access to useful information

The material in these reports indicates that similar discussions about reconfiguration and deregulation that are current in dentistry in the UK and elsewhere are also going on in other regulated professions. However the clinical element in health care delivery limits the relevance of the comparison.

B. Impacts, including risks and benefits

f) What factors emerge as the major impacts, including risks and benefits, of introducing direct access?

g) What evidence was found for these factors?

h) Is there any evidence to show that risks to patients/clients have been increased by the introduction of direct access?

i) Is there any evidence to show that patients/clients benefit from the introduction of direct access?

Before addressing these specific questions, we will first summarise the selected research evidence.

Evidence on the impact of direct patient access to DCPs comes predominantly from papers relating to the role of dental hygienist and dental therapists in the US. Nineteen studies from the US are reviewed, including six dealing with Dental Health Aide Therapists in the State of Alaska. Of the non-US papers, four relate to the UK, four to Australia, two to Norway, and one each to New Zealand, Sweden, Spain, Italy and Canada. Twenty three of the 35 papers deal with dental hygienists, nine with dental hygienists, one with dental assistants, one with denturists, and three with both hygienist and therapists. Note however that some papers do not examine direct access arrangements as such, but compare knowledge, clinical decision-making, costs etc pertaining to DCPs and dentists. As such they provide relevant information on the appropriateness of different professional groups assuming greater autonomy in their clinical activity.

Alaska

In a pilot study, Bolin (2008) aimed to establish if DHATs were delivering dental care within their scope of training in an acceptable manner, and to assess the quality of care and incidence of reportable events during or after dental treatment. The authors studied case notes relating to 640 dental procedures performed in 406 patients in five clinics where DHATs worked under direct or general supervision. Cases for comparison related to patients treated by the supervising dentists in two Alaskan regional hub clinics during the same period and from the same sampling frame. Both datasets were randomly selected. No significant differences in the consistency of diagnosis and treatment or in the number of any kind of

postoperative complication as a result of primary treatment were found between the two datasets. However, presence or adequacy of radiographs was more likely for patients treated by dentists than for those treated by DHATs. The author concluded that the deployment of DHATs in these settings had increased access to dental care without increasing risk to patients, although further research was required to evaluate any long-term effects of irreversible restorative treatment by DHATs. (comparative study, evidence level: III-2; study quality: good).

Wetterhall *et al* (2011) and Bader *et al* (2011) investigated aspects of the Alaska DHAT model. This model is also the subject of a report by the same authors prepared for the W. K. Kellogg Foundation, Rasmuson Foundation, and Bethel Community Services Foundation (Wetterhall et al. 2010). Wetterhall's 2011 paper used quantitative and quantitative methods to assess patients' and stakeholders' satisfaction with the model and the role of the DHATs in the particular cultural context. The authors studied DHATs working in both unsupervised and indirectly supervised practices in relation to roles, training, risks, and supervision arrangements. Questionnaires were completed by 111 adult patients and 233 caregivers of children in five sites serving American Indian and Alaska Native communities. Outcomes included patient satisfaction, perceived access and OHQOL. Patient satisfaction was reported to be generally high and did not vary by site or age. Interviews with stakeholders indicated that DHATs improved access to urgent care for the villagers they served (qualitative study. study quality: moderate).

Bader *et al* (2011) and Wetterhall *et al* (2010) report the same clinical evaluations of patients treated under the general supervision DHAT model in the same five sites, and the authors claim that their evaluation is the most comprehensive undertaken for therapists practicing in the United States. The study was based on an audit of treatment records of 316 children and 89 adults. The DHATs' clinical technical performance was compared with dentists' and found to be good, with similar rates and types of treatment deficiencies. For example deficiencies in restorations were found in 15% of DHAT cases and 12% of dentists' cases. In respect of risk or harm to patients served by DHATs, only one complication occurred in 54 restorations and 37 extractions provided by DHATs, within a context of very high untreated decay amongst patients. (comparative study, evidence level: II-2; study quality: good).

Wetterhall *et al* (2010) also report process evaluation of the five DHAT sites. Most of the assessed 91 specific items relating to process of care were satisfactory. The main deficiencies reported were in facilities, equipment, administration (written descriptions of policies), and sterilisation, where between 5 and 6 of 39 sterilization items were judged to be

deficient. Consultations with supervising dentists occurred for 7 percent of children and 5 per cent of adults. The proportion of untreated caries in children in the five sites was lower, and presence of fissure sealants higher, than in non project villages. The authors conclude that the DHAT model was providing an acceptable level of clinical treatment, structure and process of care and that "therapists are performing well and operating safely within their scope of practice" (observational study, evidence level: IV; study quality: moderate).

Williard *et al* (2011) also report on the Alaska model of supervision in a small scale study based on telephone interviews with 3 DHATs and their collaborating dentists and service managers. The study concludes that general supervision worked well, and that patient safety was not compromised (qualitative study; study quality: weak).

Two studies conducted in Australia examined the clinical performance of dental therapists and patient satisfaction. Calache et al (2009) aimed to assess the capacity of dental therapists to provide direct dental fillings to patients older than 25 years, on the prescription of a dentist. At that time such therapist treatment was restricted to patients under 26 years of age. Seven dental therapists placed 356 restorations in 115 patients in a dental hospital setting with the support of a dentist. At time of placement, 94% of restorations were assessed as meeting all standards (Level 1) and 6% as acceptable (Level 2). These restorations were reviewed six-months post placement by dentists blinded as to which restorations were placed by the dental therapists. 95% were judged to be satisfactory or better at 6 months review. All patients (n=145) at the time of placement of the restorations expressed strong satisfaction with the dental therapists' work, including explanations, information and dental treatment received, general helpfulness of the dental therapists, the therapists' professional skills, and the review provided by the dentist. The authors concluded that the standard of restorations provided by dental therapists was considered to be at least similar to that expected of a newly graduated dentist. As a result, dental therapists were held to be capable of supplying direct coronal restorations to adults, and suggest that the wider deployment of dental therapists is justified. (comparative/observational study, evidence level: II-2, IV; study quality: good).

Calache *et al* (2011) report Australian dentists' and patients' assessments of the knowledge and treatment standard of ten university-educated dental therapists on completion of a course designed to enable them to translate their current clinical scope of practice to adult patients aged 26 and over. Supervising and supporting dentists rated their knowledge and clinical skills as good to high and considered them safe to treat adult patients. Patients were very satisfied with the dental treatment provided. The authors conclude that the course enabled the therapists to develop the knowledge and skills required to treat adult patients without the

prescription or supervision of a dentist. (observational study, evidence level: IV; study quality: moderate).

Dental Hygienists

The following four studies examined the performance of dental hygienists in conducting examinations and making treatment and referral decisions. The first involved children with relatively low treatment needs, while the others concerned elderly care home residents or children with high treatment needs.

A study in Norway by Wang *et al* (1994) investigated the efficiency of the screening role played by the dental hygienist. In Norway the prevalence of childhood caries is relatively low, and delegation of dental examination to hygienists under the indirect supervision of a dentist is current permitted. The study assessed the clinical time spent providing child dental care when hygienists examined all children and referred to dentists those children who required care outside their clinical remit. A total of 1642 records were examined. 47% of children had their care split between hygienist and dentist. Hygienists were responsible for deciding recall intervals for the children under their care, and the study found that when hygienists chose long recall intervals, this did not lead to more complicated, time-consuming treatments at a later date. On the other hand, 26% of children without new caries on examination were referred to the dentist by the hygienist. While this may have been for orthodontic reasons (this referral rate was higher for 7-11 year old children), the authors speculate that this may be evidence of dental hygienists referring children who did not need restorative treatment. In terms of costs, in the Norwegian context it was concluded that the direct access model would be profitable as long as hygienists do not spend more than 2.5 times as long as the dentist-assistant team in undertaking the same treatments. (observational study, evidence level: IV; study quality: moderate).

Kwan *et al* (1998) compared the performance of four dental hygienists and four dental therapists with a standard examiner in conducting caries prevalence survey of 5- and 12-year-old children in Yorkshire, UK. The hygienists and therapists were randomly selected from those employed in the Community Dental Service. Training and calibration were carried out according to national guidelines for caries prevalence surveys. Sixteen 5-year-old and sixteen 12-year-old children were examined in the calibration exercise. For 5-year-old children, a good level of agreement with the standard examiner was achieved (sensitivity scores 0.84-0.98, specificity scores 0.93-0.97, kappa scores 0.80-0.89). For 12-year-old children, sensitivity scores ranged from 0.56-0.95; specificity scores from 0.93-0.99; and kappa scores from 0.66-0.83. Four of the eight examiners failed to achieve the minimum

scores on all measurements. The authors concluded that while therapist and hygienists could act as examiners in caries prevalence surveys of 5-year-old children, further training was required to meet the national standard for agreement in surveys of 12-year-old children for four of the eight examiners. (comparative study, evidence level: II-2; study quality: good).

Hawley (1999) conducted a pilot study in the UK to measure the validity of using a dental hygienist to carry out school screening. Following a standard training programme a dental hygienist, a newly appointed dental officer and an epidemiologist, who acted as the standard, all screened the same group of 98 school children attending an inner city primary school with known high levels of disease on two occasions. Referrals, the reasons for referral and the repeatability were measured. The two dentists had a higher rate of referral than the dental hygienist (62% for both dentists *vs.* 27% for the dental hygienists). The Dental Officer achieved the required standards of sensitivity and specificity compared with the Senior Dental Officer but the hygienist did not. The authors concluded that the standard training programme used to prepare Dental Officers for school screening was insufficient for this hygienist's needs. (comparative study, evidence level: III-2; study quality: poor).

Hopcraft (2011) investigated the ability of dental hygienists to undertake a dental examination for residents of aged care facilities, devise a periodontal and preventive treatment plan and refer patients appropriately to a dentist. Four dental hygienists saw 510 residents of 31 aged care facilities in Victoria, Australia. An experienced dental epidemiologist acted as reference examiner. The authors found excellent agreement between the dentist and hygienists regarding the decision to refer residents to a dentist for treatment, with high sensitivity (99.6%) and specificity (82.9%). There was little evidence of over-referral - 8% of referrals were judged to be unnecessary. The authors concluded that examination and referral skills of dental hygienists were good, and represented “a safe, efficient and effective use of health resources" in such settings. (comparative study, evidence level: III-2; study quality: moderate).

Freed *et al* (1997) compared clinical, structure, process of care and other outcomes in 9 independent dental hygienist practices and 6 dental practices in California, using 25 patient records per practice and questionnaires completed by practitioners and patients. The study found that on measures of patient satisfaction, access, record systems and infection control, the independent dental hygienist practices scored significantly higher than the dentist practices, but lower on after-hours information. Radiation safety problems were found in 2 hygienist and 3 dental practices. Dental hygienist practices performed better in 6 of 12 processes of care measures, and no worse in the others. Patient satisfaction was 98%, and

75% were happy with fees in the hygienist practices. The study concluded that the level of structure and process of care and patient safety in hygienist practices was as good or better than in dental practices, and that "independent dental hygienist practice did not increase the risk to the health and safety of the public or pose an undue risk of harm to the public" (observational study; evidence level: III-2; study quality: good).

A second study in California examined whether these same independent dental hygienist practices had a beneficial effect on access to dental care among underserved groups (Perry, 1997). The authors surveyed 677 adult patients of 8 independent hygienist practices to investigate the characteristics of patients of these practices, including their history of dental care access and their subsequent attendance record. The authors concluded that access to care had widened, with a high rate of subsequent visits to the dentist, even among irregular attenders or those previously with no dentist, and therefore there was no evidence that the dental hygienist practices had decreased access to dentists (observational study, evidence level: IV; study quality: moderate).

In a more recent study of alternative dental hygienist practice in California Metz et al (2011) analysed archival documents, stakeholder interviews, and two surveys of the registered dental hygienists (in 2005, involving 2776 dental hygienists in dental practices and 110 in alternative practices; and in 2009, involving 176 in alternative practices). Residents of care homes with no other source of dental care represented the majority of their caseload. While 59% worked in the office of the dentist who serves as their “dentist of record” for licensure, only 28% of dental hygienists in alternative practices reported that their dentist of record will accept regular and ongoing referrals from them. 48% reported it “somewhat difficult” or “difficult” to find someone to accept their referrals, and estimated that they were unable to get a referral for 11% of the patients who needed one. The authors conclude that for dental hygienists in alternative practice, referring patients for ongoing needed dental care was very challenging. Overall they conclude that viable alternative methods have been developed for delivering preventive oral health care services in a range of settings with patients who often have no other source of access to care. (observational study, evidence level: IV; study quality: moderate).

Battrell (2008) conducted a qualitative study of the dental hygienist Limited Access Practice (LAP) model established in the State of Oregon in 1997. Normal dental hygienist code of practice activities were sanctioned without supervision by a dentist, with the dental hygienist referring patients needing services beyond their LAP scope of practice to a named collaborating dentist. Seven dental hygienists and 2 collaborating dentists were interviewed, and this

material supplemented by non-participant observation and document review. The author concluded that the dental hygienists and dentists had positive relationships, and found no evidence of lower quality of care in unsupervised dental hygiene practices (qualitative study. Study quality: weak).

In a small scale study of access to dental care in an under-served area of rural Missouri, USA, Squillace (2012) examined whether patients of an independent dental hygienist in a public health clinic had (a) a history of prior visits to other practicing dental providers, and (b) a history of subsequent visits to the hygienist. An audit of 1126 child patient records was conducted. The children were aged 4 to 13. The study found that the service was attracting younger children with no previous dental contacts, and that such children had a higher rate of subsequent recalls, as did school age children. The author concludes that access to preventive oral health care had been improved. (observational study, evidence level: IV; study quality: moderate).

Patient satisfaction with dental hygienists licenced in Missouri USA to perform restorative treatments (place amalgam, composite, glass ionomer fillings and stainless steel crowns) under direct supervision was investigated by Cooper (2008). Sixty four adult patients of 23 senior dental hygiene students completed a questionnaire. Ninety-eight per cent were satisfied or very satisfied with their overall clinic experience, and 98 per cent also thought the quality of care was the same or better than previous dental care they had received. Ninety-seven percent would return to this clinic for future restorative work. Patients were significantly more satisfied with the fees, communication, caring, organization, and preparedness of the dental hygiene student as compared to their last restorative visit to a private dentist. The authors conclude that the majority of patients were satisfied with the overall experience of restorations placed by a dental hygienist. (observational study, evidence level: IV; study quality: poor).

A study in Kansas by Simmer-Beck *et al* (2011) evaluated the clinical activity of dental hygienists licenced to work independently but not to perform the range of restorative care possible in the Missouri model. Their patients are limited to children eligible to Medicaid or similar schemes, and their clinical interventions to non-restorative treatment. They are also trained to refer to a registered dentist, and to consult using tele-dentistry links. Twenty–eight dental hygiene students provided prophylaxis, radiographs, sealants, fluoride varnish, oral health education and nutritional counselling to 339 children aged 9 to 15 during the 2008 to 2009 academic year. Twenty eight per cent of the children were found to have untreated decay and 63% were referred to a dentist. By the end of the school year, 11% had begun the

process of seeking restorative care from a dentist. The authors conclude that this model could serve to overcome barriers in reaching and providing vulnerable children with oral health care. (*reviewer's comment:* The study did reveal possible over-referral and a risk that most referrals for dental care may not be acted upon by parents). (observational study, evidence level: IV; study quality: poor).

Baillit (2008) studied the financial implications of a model such as that evaluated by Simmer-Beck (2011). The authors used financial modelling techniques to test the financial feasibility of providing dental hygienist based care from a portable clinic in schools in US States with different Medicaid reimbursement rates. The authors conclude that one-third of the States examined had adequate Medicaid fees to support the program as modelled. (*reviewer's comment:* While costs per child were influenced by the rate of referral to a dentist, the study did not consider the potential for the high level of non-take-up of referral that Simmer-Beck *et al* report). (financial modelling study, evidence level: IV; study quality: poor).

Other DCP groups

Devlin (1994) studied the impact on dentists' fees of the legalisation and deregulation on denturists' (clinical dental technicians') practice following the 1988 Dental Act in New Zealand. The reform allowed direct access for patients requiring denture work, and therefore the choice to use a dentist or denturist practice. Fee data from annual surveys of dental practices was used to investigate whether fees charged by dentists for full and partial dentures had been impacted by the increased direct competition from denturists following the law change. Predicted dentist fees using previous trends were compared with the actual fees charged. The study found that while actual fees charged for dentures n 1992 were lower than predicted, and for all other items, 1992 fees were higher than predicted, the difference was marginal and not statistically significant. The author concludes that deregulation did not lead to lower fees for patients or lower income for dentists. (observational study, evidence level: IV; study quality: good).

Mitchell (2006) studied the impact of a change in the law in Maine, USA which allowed dental assistants to undertake scaling, a treatment previously restricted to dental hygienists and dentists. The authors conducted surveys of dental assistants and hygienists 6 years after implementation. Responses of 696 dental hygienists and 59 scaling dental assistants were used in the analysis. Although workforce data suggest an increase in access to dental care, hygienists were much less convinced of the benefit to patients of the law change than were

dental assistants. The study did not address issues of the standard of treatment, referrals, or patient safety. (observational study, evidence level: IV; study quality: poor).

The remainder of the studies reviewed below do not directly reflect an established or simulated direct access mode of practice. However they are included in this review because they may provide further evidence regarding the capability and confidence of DCPs to see and treat patients independently of a dentist's referral.

The systematic review by Galloway *et al* (2004) investigated of the effectiveness and cost-effectiveness of Professionals Complementary to Dentistry, as DCPs were then termed. While the authors noted that there were few UK studies and that study designs were often poor, they concluded that DCPs with appropriate training can perform screening, diagnose a range of dental and oral conditions and complete a wide range of dental procedures as well as dentists.

Brocklehurst *et al* (2012) used a purposive sample to investigate the abilities of UK dental and dental hygiene students and dental, dental hygiene and dental nurse practitioners in detecting occlusal caries in comparison to the International Caries Detection and Assessment System and the WHO diagnostic threshold. 102 clinical photos were scored by a total of 221 subjects following a brief training package in a dental school setting. Differences in performance were compared using sensitivity and specificity. All groups met the WHO sensitivity standard, but the median specificity score was lower than the WHO recommended threshold. The study concluded that even with minimal training, different members of the dental team show the potential to screen for occlusal caries to a similar standard as primary care dentists. (*reviewer's comment:* However the lower specificity score implies cases may be potentially over-referred). (comparative study, evidence level: III-2; study quality: good).

Scofield *et al* (2005) conducted an inquiry in the US regarding the clinical competence of dental hygienists in administering local anaesthesia, which by 2003 was permitted in two thirds of States, although most require direct dentist supervision. The study aimed to test the view that quality of care would be compromised and patient safety jeopardized because dental hygienists do not have adequate background knowledge to prevent complications and recognize emergencies caused by anaesthetics. The measure used was reported disciplinary actions against dental hygienists and dentists, rather than any direct measure of clinical activity or casenote examination. A survey form was sent to 26 state dental boards which asked, among other things, how many dental hygienists and how many dentists were

disciplined each year between 1990 and 1999 as a result of their performance in administering local anaesthesia. Responses were received from 18 of the 26 States contacted. Five said the relevant information on disciplinary action was not available for either dentists or dental hygienists: none reported any such action against dental hygienists, and only one reported actions against (2) dentists. The authors conclude that the evidence demonstrates dental hygienists successfully and safely administer local anaesthetics to dental patients. (observational study, evidence level: IV; study quality: poor).

Hakeberg *et al* (2008) investigated whether dental anxiety levels differed for treatments provided by dental hygienists and dentists in Sweden. A convenience sample of 393 adult patients was collected from six dental clinics, and patients were asked about anxiety level for previous treatment provided by dentists and dental hygienists. Patients reported higher dental anxiety for dentist treatment compared with dental hygienist treatment (observational study, evidence level: IV; study quality: poor).

Knowledge and patient support

A number of studies are pertinent to an evaluation of risks which may be associated with direct access or unsupervised practice of dental hygienists or dental therapists, in that they examined aspects of knowledge or patient support. All but the first of these seven studies concern dental hygienists.

Family violence

A UK study by Chadwick *et al* (2009) sought to identify the extent that dental therapists had undergone training in child abuse, their experience of child abuse, and perceived barriers to child abuse prevention. Of 420 respondents to a postal survey of registered dental therapists, 83% reported having received training in child protection. 34% had suspected child abuse amongst their patients, and while most of these had recorded their suspicions in the case notes, only a minority (63 of 135) had referred the child. However most dental hygienists said they would discuss a case with a dentist or other relevant professional. (observational study, evidence level: IV; study quality: moderate).

A study on screening and referral of suspected domestic violence was conducted in the US by Mascarenhas (2009). A convenience sample of 190 dental hygienists and 169 dentists completed a questionnaire regarding their assessing practices, actions taken, deterrents in identification and referral, prior domestic violence education and perceived need for domestic violence education. The authors found no difference in the two groups either in regard to their attitudes towards domestic violence or the action they took. Dental hygienists were more

positive towards undertaking additional training. They concluded that both groups were comparable in terms of safeguarding patients, but that both would benefit from training. (comparative study, evidence level: III-2; study quality: moderate).

Oral cancer and smoking cessation.

Lopez-Jornet *et al* (2006) conducted a telephone survey of 140 (response rate 58%) dental hygienists in private dental practice in Murcia, Spain concerning knowledge of oral cancer risk factors and their education and training needs on oral cancer. While knowledge of risk factors was generally good, only 51% identified sun exposure as a risk factor for labial cancer. 57% did not consider themselves sufficiently well trained to detect suspected oral cancer lesions, and 84% felt insufficiently trained in early diagnosis and prevention. Only 51% routinely gave advice to their patients on prevention of oral cancer. The authors conclude that more training programmes are required. (observational study, evidence level: IV; study quality: moderate).

In a similar study in Italy, Nicotera *et al* (2004) explored knowledge of risk factors and diagnostic procedures for oral cancer, attitudes and behaviour among dental hygienists. From a random sample of 472, 125 responded to a postal questionnaire (45% response rate). Almost all dental hygienists correctly indicated tobacco usage and having a prior oral cancer lesion as risk factors, but alcohol use and age were only cited by a minority (49% and 35% respectively. Only 14% identified the floor of the mouth as a common site for cancer, and fewer than half (43%) recognised that an early oral lesion usually is a small, painless and red area Only 4% knew the examination procedures of the tongue. The authors recommend further educational interventions in order to early detect and prevent oral cancer. (observational study, evidence level: IV; study quality: moderate).

Brothwell *et al* (2009) compared Canadian dentists' and dental hygienists' practices regarding smoking cessation advice and support, and investigated the influence of demographic and psychosocial factors on brief intervention counselling delivery, A questionnaire was sent to all dentists and dental hygienists in Manitoba, and was returned by 275 dentists and 223 dental hygienists. Hygienists were more likely to provide assistance to quit, and more likely to refer to a support agency, than dentists. Dental hygienists were also less likely to cite patient reaction as barrier. (comparative study, evidence level: III-2; study quality: good).

Chambers (1996) also investigated dental hygienists' knowledge and practice regarding smoking cessation advice and support. 340 dental hygienists in Iowa, USA completed a postal questionnaire. Only 5% of the hygienists routinely asked their patients about their tobacco use. Thirty-five percent routinely advised smokers to stop, and 13% said they

routinely assisted smokers to stop. None of the hygienists routinely engaged in follow-up to tobacco cessation activities. The authors conclude that hygienists have the potential of greatly enhancing tobacco cessation efforts, but require continuing training to do so. (observational study, evidence level: III-2; study quality: poor).

Diabetes

Boyd *et al* (2008) conducted a survey to assess diabetes knowledge, beliefs and clinical practice among a convenience sample of 392 members of the American Dental Hygienists' Association. Most respondents were aware of the major risk factors for diabetes, and correctly answered (i.e. agreed with statements) regarding oral health and diabetes. However the authors found major knowledge deficiencies regarding the relationship between haemoglobin value and diabetes control, the classification of diabetes, and the impact of some diabetes medications on dental care. The authors conclude there is a need for more professional education on diabetes and the dental patient in order to increase confidence and competence.

(*Reviewer's comment:* there is no indication of which respondents worked within any form of direct access arrangement). (observational study, evidence level: IV; study quality: poor).

C. Challenges and mitigation of risk

j) What challenges emerge from the literature in relation to the introduction of direct access and what evidence is there of successful management of those challenges?

This question has been addressed in terms of papers identified that reveal potential barriers to the adoption of direct access for DCPs. It should be noted that a specific search was not undertaken to find papers examining, for example, dentist attitudes towards the employment of DCPs. The papers reviewed below were found via the searches undertaken to identify those dealing with direct access or related issues, and therefore are far from exhaustive of this subject.

Potential barriers to direct access thus identified relate to practitioner and patient attitudes towards an extended DCP role.

Practitioner attitudes.

Hopcraft (2008) investigated the factors relating to the employment of hygienists and the attitudes of the oral health workforce in Victoria, Australia. A postal survey of a random

sample of dentists, periodontists, orthodontists and hygienists was undertaken. Dentists and specialists were grouped into those whose practice employed or did not employ a hygienist. 112 dentists (including 70 who employed a hygienist), 23 periodontists (11 employers), 49 orthodontists (26 employers) and 67 hygienists responded. 52% of hygienists believed that they should be allowed to practise independently, but this was not supported by the majority of dentists and specialists, whether or not they employed a hygienist. There was qualified support from employing dentists for increasing the scope of practice for hygienists. The authors concluded that dentists employing hygienists acknowledged their contribution to increasing practice profitability, efficiency and accessibility of dental services to patients. Hygienists and employers supported increasing the scope of dental hygiene practice, but the majority of non-employers did not. (observational study, evidence level: IV; study quality: moderate).

A study in Norway by Abelsen (2008) aimed to investigate attitudes among dentists and dental hygienists to the policy objective of delegating more dental work from dentists to dental hygienists. A random sample of 1111 dentists and 268 dental hygienists were sent a questionnaire: response rates were 45% for dentists and 42% for dental hygienists. The survey sought to explore any discrepancies between current and preferred mix of different work tasks, as well as attitudes towards the idea of substituting dentists with dental hygienists for certain work tasks and dental hygienists should acting as the entry point for dental services. Dentists spent nearly 40% of their time on examinations, screening and basic treatments that dental hygienists are qualified to perform. While dentists were generally reluctant to delegate this work in order to spend more time on complex treatments, 60% of dentists said it was 'desirable to delegate' more tasks to dental hygienist. Only 21% agreed that dental hygienists should be the entry point for dental services. In contrast, dental hygienists would prefer to do relatively more basic treatments and fewer examinations and screening, and the vast majority supported the idea that they could be the entry point for dental services. The authors conclude that the division of labour between dentists and dental hygienists in Norway will stay much the same if dentists are responsible for instigating change. (observational study, evidence level: IV; study quality: moderate).

Turner et al (2011) investigated autonomous working among singly and dually qualified dental hygienists and therapists in UK primary care through a national survey. 150 hygienists, 183 hygienist-therapists and 152 therapists responded. Over 80% of hygienists and hygienist-therapists reported undertaking BPEs, history-taking, pocket charting, mucosal examinations and recall interval planning autonomously. Similarly high proportions of hygienist-therapists and therapists reported giving local analgesia and choosing restorative materials

autonomously. However, fewer than 50% of all three groups said they undertook dental charting, fissure sealing, resin restorations, taking radiographs, and tooth whitening autonomously. While confidence in undertaking such activities without a dentist's referral was generally high, it was lower in respect to mucosal examinations, identifying suspicious lesions, interpreting radiographs, tooth whitening, and (except for singly qualified dental therapists) diagnosing caries. All three groups expected a favourable view of direct referral from at least some of the dentists they worked with, and 15% or fewer expected a generally unfavourable response. The authors conclude that there were high levels of experience and confidence in DCPs' ability to work autonomously across a wide range of investigative activities, treatment decision-making and treatment planning. The exceptions to this pattern were appropriate to the different clinical remit of these groups. (observational study, evidence level: IV; study quality: moderate).

Public attitudes.

Several studies have investigated public attitudes toward restorative treatment by DCPs (see also Cooper *et al* (2008)). These patients had not in general received treatment from DCPs.

Dyer (2008) explored lay views on skill-mix in dentistry and the experiences and social acceptability of care provided by operating dental auxiliaries in South Yorkshire, UK using qualitative semi-structured interviews and focus groups in participants' homes and neutral public venues. A purposive sample of 27 adults was used to ensure a variety of ages, social and cultural backgrounds. The study identified three main themes, with two (*Perceptions of the Nature of Dental Services* and *dental anxiety*) influencing views in the third (*Support for Skill-mix*). Consumerist views and greater dental anxiety were related to lower support for skill-mix. However, the possibility of lower treatment costs was seen as beneficial. Public service views saw increased efficiency and access to services as benefits of skill-mix. Views on auxiliaries treating children varied from overt opposition to reluctant acceptance. The need for careful communication of the rationale for skill-mix was highlighted. The authors concluded that careful communication of the rationale and potential benefits of skill-mix was needed. (qualitative study, study quality: strong).

Dyer (2009) used a patient telephone survey in South Yorkshire, UK to investigate public awareness and the social acceptability of the use of dental therapists in dental care. Of the representative quota sample of 500, only 15% were aware of dental therapists. Fifty-seven per cent were willing to receive simple restorative treatment from a therapist, and acceptability was associated with being younger and having a perceived need for treatment. Forty-seven per cent were willing to allow a therapist to restore a child's tooth. The authors

conclude that public education needed to increase the acceptability of restorative treatment given by a therapist, and question whether informed consent for such treatment will be provided (observational study, evidence level: IV; study quality: moderate).

k) ***How has risk been mitigated (e.g. additional training, supervision?)***

Five mechanisms to regulate and monitor the practice of dental hygienists and therapists to whom patients have direct access were identified in the selected literature. Material detailing arrangements that been developed in other countries or states is collated in Appendix 1.

i) Limitations of clinical remit, patient groups, or settings. Commonly limitations of the DCPs' clinical remit relate to restorative treatments, particularly those classed as "irreversible." There are examples of such limitations being widened over time or varying according to levels of experience, training or supervision. In some models, patient groups have been limited to children, the elderly, the under-served (defined by the spatial distribution of dentists and their patient base), those on welfare benefit (e.g. Medicaid, Medicare). Specified settings are commonly public service clinics or walk-in centres (as opposed to private practice), schools, care homes or other residential settings. There was no found evidence demonstrating the value of restriction by patient group or setting.

ii) Some models of direct access have stipulated **levels of experience, qualification or training** required by DCPs working independently or under general supervision. Again no evaluation material has been found which tests or compares restrictions of this kind.

iii) Formal supervision by dentists is a common, but not universal, method of regulating DCPs working directly with patients. These arrangements may involve a `named dentist', as in the Alaska DHAT model. This dentist monitors activity, provides advice by telephone or audio-visual link, and accepts referrals.

iv) Audit and inspection arrangements may exist outside supervision by a dentist. For example, the Alaska DHAT model maintains close audit returns of local performance (see Appendix 2).

v) DCPs may have a **line management structure** such as exists within the Childsmile health improvement in programme in Scotland with its use of Extended Duties Dental Nurses working in schools and nursery schools, answerable to a programme co-ordinator and

ultimately the Director of Dental Public Health within each of the fifteen Scottish Health Boards.

These approaches to regulation and patient safety are by no means mutually exclusive, or limited to arrangements for direct access to dental care. For example, Taylor et al (1991) list the following limitations on practice in physical therapy direct-access models, as they vary across different US States: diagnosis requirements, eventual referral requirements, physical therapist qualifications, patient consent requirements, and practice setting restrictions.

D. Gaps in the Evidence

1. Despite the fact that New Zealand is generally recognised as pioneering direct access to dental care provided by DCPs, particularly therapists and nurses, only one paper (Squillace, 2012) which evaluates direct access in New Zealand was identified. The systematic review undertaken by Galloway *et al* (2003) did not include any New Zealand studies. The review of the global literature on Dental Therapists conducted by Nash et al (2012) includes a 58-review of the development, organisation and performance of the New Zealand Dental Therapist profession. See however the detailed material included in the Appendices to this Report.

2. Evaluations of long term outcomes of dental therapists' restorations were not found (see Bolin (2008)).

3. Very little research evidence pertaining to dental nurses, dental technicians, and clinical dental technicians was found.

4. The research literature is dominated by papers from the US, a reflection both of recent developments in Alaska and elsewhere in response to poor access to dental care on the part of many Americans, and the controversy regarding safety and efficacy of independent 'mid-level' practitioners.

5. Only three research studies (Metz et al 2011), (Perry *et al* (1997), Simmer-Beck *et al* (2011)) made reference to the referral pathway from DCP to dentist. There is a need for more detailed evidence on the extent patients and families fail to follow up referral to a dentist once they or their child has received treatment from a DCP, and the extent to which any such failure of referral is associated with treatment need.

6. There was insufficient relevant and good quality evidence to be able to evaluate different models of direct access with, for example, different levels of supervision. However Scofield *et al* (2005) reports that there were no reported disciplinary actions against dental hygienists in respect to the administration of anaesthesia in 13 responding States over a ten year period. The anecdotal evidence that US dental hygiene malpractice insurance premiums are the same regardless of the level of supervision the hygienist practices under or the range of clinical services she performs[1] supports Scofield's conclusion that dental hygienists successfully and safely administer local anaesthetics to dental patients under varying supervision arrangements. This suggests that there may be no significantly higher risk to patients irrespective of the different levels of supervision established in different States.

7. The GDC requested that the review looked for evidence of what shared record keeping arrangements had been established. Although the research evidence did not provide such material, some of the supplementary material included in Appendix 1 may be releavnt, particularly the Wetterhall et al 2010 report on the Alaska DHAT service.

[1] Source: American Dental Hygienist Association, June 2012.

Evidence from non-dental health studies

Figure 4 shows the number and range of studies found by our second literature search for papers dealing with direct access in other health services. As patient safety was the prime concern of the GDC in commissioning this review, we have restricted our summarising of this evidence base to issues of patient safety, including treatment and referral quality. We have further limited the review to three areas felt to be most relevant to primary care based dental services: direct access to nurses in primary care, including telephone triage schemes, physiotherapy, and audiology. It is noteworthy that the overall quality of these studies tended to be better than in the selected dental studies.

Overall the evidence from the eight nursing studies is favourable, in that six (Gardner *et al* (2005); Everett *et al* (2009); Coulthard *et al* (2003); Myers *et al* (1997); Offerdy (2002); and Lattimer et al (1998)) found no evidence that patient safety had been compromised by use of nurses or nurse practitioners. The systematic review by Laurante *et al* (2009) also reports no impact on health outcomes, but cautions about study quality. Moll van Charante et al (2006) found considerable variation among nurses making telephone based assessments and referral decisions.

The evidence from physiotherapy studies on patient safety or referral quality is more mixed, with eight studies concluding that direct access does not pose a risk to public safety (Ferguson *et al* (1999); Mackay (2009); Mitchell (1997); Moore *et al* (2005a; 2005b) Shoemaker *et al* (2012); Daker-White *et al* (1999); Childs *et al* (2005)), and six with equivocal (Leemrijse *et al* (2008); Foster *et al* (2011); Hattam (2004)) or at least partially negative findings (Jette *et al* (2006); Riddle *et al* (2004); Schmid *et al* (2008)). The main recommendation from this latter group was the need for relevant training to improve assessment and referral skills.

The findings from the two audiology studies (Zapala *et al* (2010) and Swan *et al* (1994)) were very positive about patient safety and direct access to such services.

Finally we note the systematic review of evidence about extended roles for allied health professionals conducted by McPherson et al **(**Cochrane review) (2006). While 21 studies progressed to full review and data extraction, the authors were unable to evaluate any pooled effects as patient health outcomes were rarely considered. They conclude that health outcomes, how best to introduce such roles, or how best to educate, support and mentor these practitioners, had rarely been evaluated. (systematic review, evidence level: I; study quality: good).

i. Primary care nursing studies

Laurant *et al* (2009) conducted a Cochrane systematic review on the substitution of doctors by nurses in primary care, covering papers to 2002, 4253 articles were screened of which 25 articles, relating to 16 studies, met the inclusion criteria. In general, no appreciable differences were found between doctors and nurses in health outcomes for patients, process of care, resource utilisation or cost. The findings suggest that appropriately trained nurses can produce as high quality care as primary care doctors and achieve as good health outcomes for patients. However, the authors warn that this conclusion should be viewed with caution given that only one study was powered to assess equivalence of care, many studies had methodological limitations, and patient follow-up was generally 12 months or less. (systematic review, evidence level: I; study quality: good).

Everett *et al* (2009) studied nurse practitioners' and physician assistants' impact on access to care. While safety or quality of referral was not directly considered, no differences were observed in patient-reported difficulties or delays in obtaining health care. When taken in context with the current body of literature, the authors conclude that their data suggest nurse practitioners and physician assistants may be acting in a substitute role as primary care providers to underserved patients with a range of disease severity. Clear operational definitions for the potential roles of nurse practitioners and physician assistants is lacking, as is evidence of their potential to contribute to the functions of primary care within each of the potential roles. (observational study, evidence level: IV; study quality: moderate).

Gardner *et al* (2005) sought, among other aims, to identify the impact of nurse practitioner services on health care outcomes specifically in relation to access, safety, and clinical effectiveness. Support teams undertook clinical reviews of nurse practitioners' assessments and management plans for 396 patients across three nurse practitioner models. There were only three disagreements, none with severe or serious implications for the patient's treatment. Information about patient outcomes was not always available, and the support teams assessed a total of 185 completed clinical outcomes across the three models. In 15 cases (8%), the agreed desired outcome was not achieved. In all 15 cases, the team considered that the circumstances were beyond the control of the nurse candidate concerned. Anticipated patient outcomes were achieved in 92% of cases where data were available. Thus, in addition to meeting an identified health care need, nurse practitioner services were safe and effective. (observational study, evidence level: III-3; study quality: good).

Coulthard *et al* (2003) investigated a nurse led direct access service for children with urinary tract infections, The model was developed to try to improve the service for children with urinary tract infections by bridging the primary and secondary healthcare interface, increasing the involvement of general practitioners, and reducing hospital attendance. Results suggest management was improved, and the model was preferred by general practices and families alike, and saved time for paediatric clinics. Although the authors anticipated a slight increase in referrals through greater awareness and a slight decrease in false referrals, the diagnosis rate doubled overall and quadrupled in infants and in children without urethral symptoms. The authors conclude that a nurse led intervention improved the management of urinary tract infections in children, was valued by doctors and parents, and may have prevented some renal scarring. (randomised cluster study, evidence level: II; study quality: moderate).

Myers *et al* (1997) conducted a retrospective study of 1000 medical records of patients seen by the nurse practitioner and the GP 6 months after the consultation. The authors found no complaints from doctors or patients about standards of examination, assessment or management, and there were no cases of reported misdiagnosis. The authors conclude that patients were capable of 'self-triaging' appropriately and safely to see the nurse practitioner, who could in turn deal successfully with their problems. Patients expressed a high level of satisfaction with the nurse practitioner. (observational study, evidence level: III-2; study quality: moderate).

Offerdy (2002) sought to investigate any differences in the decision-making processes of 11 nurse practitioners and 11 general practitioners for diagnosis and treatment when given the same patient scenarios. There was little difference in requesting laboratory tests, but nurse practitioners were more likely than GPs to provide an explanation for ordering tests. The author concludes that their explanation reflects an efficient interpretation and use of knowledge for problem solving, and that the link between the results of the tests and the diagnoses is considered by both groups. It also reinforces the need for a standard NP training. the study findings were held to support the Government's goal of developing the roles and services of nurses working in primary care and to make better use of both nurses' and GPs' time. The second main reason NPs referred to the GP was because of uncertainty, either with medication or with treatment. (observational study, evidence level: III-2; study quality: moderate).

Two studies report on safety issues in nurse manned telephone triaging services. In a single practice Dutch study of telephone nurse triage Moll van Charante et al (2006) investigated what determinants were associated with nurse advice only outcome and with subsequent

return consultations to the GP. Results indicated large inter-nurse variability in referral decision-making among the 8 nurses handling 1421 calls which was not associated with nurse experience or age, and suggest there may be safety implications in this variation. observational study, evidence level: IV; study quality: moderate).

Lattimer et al (1998) also studied a nurse manned triage service. In all, 7308 calls were received in the control arm of the trial and 7184 in the intervention arm. Of the latter, 50% were managed by the nurse without referral to a doctor. Nurse telephone consultation produced substantial changes in call management, reducing overall workload of general practitioners by 50% while allowing callers faster access to health information and advice. It was not associated with an increase in the number of adverse events. The authors concluded that this model of out of hours primary care is safe and effective. (randomised controlled trial, evidence level: II; study quality: good).

ii. Physiotherapy

In a UK study Ferguson *et al* (1999) concluded that self-referral to physiotherapy had proved successful in a single Scottish Health Centre for more than 3 years, and the envisaged potential drawbacks of being inundated with referrals and/or of missing a systemic diagnosis had not been realised. The authors argued that prevention of misdiagnosis in the study had been assisted by two factors: firstly, the use of protocols, written by the physiotherapist and discussed with a GP in order to highlight awareness of systemic conditions which might present with symptoms of a mechanical nature. These provided a check list within the subjective assessment of patients. The second factor was the easy availability of patients' medical notes and informal liaison with GPs. (observational study, evidence level: IV; study quality: moderate).

Mackay (2009), in a US study comparing physiotherapists' and surgeons' assessments of 61 patients, report good concordance levels. In 92% of cases physiotherapists and orthopaedic surgeons agreed on the recommendation of appropriateness for the patient to see a surgeon. In discordant cases, the physiotherapists tended to refer for consultation. There was 86% agreement on whether a patient was a candidate and willing to have TJR. (observational study, evidence level: III-3; study quality: good).

Mitchell (1997) made an analysis of insurance claims relating to physical therapy treatment. The fact that some direct access episodes included physician-prescribed services indicated

that physical therapists were making referrals to physicians. Thus, the authors argue, the study offers evidence that public policy objectives for direct access to physical therapy services are being achieved. (observational study, evidence level: IV; study quality: moderate).

Moore *et al* (2005a) compared clinical diagnostic accuracy (CDA) between physical therapists (PTs), orthopaedic surgeons (OSs), and nonorthopaedic providers (NOPs) at a US Army Hospital on patients with musculoskeletal injuries referred for magnetic resonance imaging (MRI). The authors report good agreement between physical therapists (75% CDA) and orthopaedic surgeons (81% CDA). They conclude that the CDA demonstrated by physical therapists was high irrespective of whether patients were referred or seen through direct access without physician referral, and that their diagnoses were highly consistent with magnetic resonance imaging results. (observational study, evidence level: III-3; study quality: good)

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Moore *et al* (2005b) also report evidence of good levels of patient safety. 95 physical therapists were credentialed to provide care throughout various medical sites over a 4 year period. Retrospective review of 50,799 patients seen under direct access showed no adverse events or episodes of litigation, regardless of how patients accessed physical therapy services. None of the physical therapists had their credentials or state licenses modified or revoked for disciplinary action. (observational study, evidence level: IV; study quality: moderate).

Shoemaker et al (2012) used multiple data sources, including a systematic review of the literature, and concluded that direct access does not pose a risk to public safety and may result in better outcomes with regard to cost and quality of care. (observational study, evidence level: IV; study quality: good).

In a randomised controlled trial by Daker-White et al (1999) in the UK, it was concluded that triage of new referrals to outpatient orthopaedic departments could be done as well by suitably trained physiotherapists as by sub-consultant orthopaedic surgeons. Patient satisfaction favoured the physiotherapist arm. No significant differences in direct costs to the patient or NHS primary care costs were found. Direct hospital costs were lower in the physiotherapist arm as they were less likely to order radiographs and to refer patients for orthopaedic surgery than were the junior doctors

study quality (randomised controlled trial, evidence level: IV; study quality: good).

Childs et al (2005) studied physical therapists' knowledge in managing musculoskeletal conditions, and concluded that experienced physical therapists had higher levels of knowledge in managing musculoskeletal conditions than medical students, physician interns and residents, and all physician specialists except for orthopaedists. (observational study, evidence level: III-3; study quality: good).

The following six studies report negative or equivocal findings relating to patient safety or referral quality.

Leemrijse *et al* (2008) evaluated the first year of direct access in the Netherlands by conducting a survey of 43 practices with 93 physical therapists. The study data were inconclusive regarding safety or referral accuracy, and the authors conclude that more research needs to be undertaken to evaluate the consequences of direct access, both on quality aspects and on cost-effectiveness. (observational study, evidence level: IV; study quality: moderate).

Jette *et al* (2006) report some reservations regarding referral quality in a comparative study of management decisions, based on a random sample of 1,000 members of the Private Practice Section of the American Physical Therapy Association. 394 participated. More than 90% of the participants made correct management decisions for 8 of 12 hypothetical patients with a variety of medical and MS conditions. For 2 of 3 critical medical conditions, however, less than 80% of the physical therapists recognised the need for immediate referral. Physical therapists with orthopaedic specialisation credentials were almost twice as likely to make correct decisions for patients with MS conditions and critical medical conditions. The results suggest the need for further emphasis on training in medical screening. (observational study, evidence level: III-3; study quality: good).

Foster *et al* (2011) reviewed 'PhysioDirect' services in the UK, where physiotherapists offer initial assessment and advice by telephone, sometimes supported by computerised algorithm treatment plans and face to face consultations. The authors conclude that concerns about safety require any PhysioDirect service to establish careful clinical risk management training and arrangements. They argue that the ability to diagnose safely and bring patients in for face-to-face assessment where appropriate is a key underpinning principle of this type of service. For that reason, some services only employ experienced band 6 and 7 physiotherapists in providing telephone-based care. (observational study, evidence level: IV; study quality: moderate).

Hattam (2004) reports on the effectiveness of extended scope physiotherapists (ESPs) in providing orthopaedic triage. The study found a relatively high level of over-referral, with 29% of ESP referrals judged inappropriate. Of these, nearly half (48 per cent) were referred by the consultant team for physiotherapy. No data on sensitivity are provided, which limits conclusions about the safety of this model. The authors conclude that there is a need to establish appropriateness of all clinical management decisions by ESPs, and that future studies should examine the outcome of intervention for all patients whether or not they are selected by the ESP for primary or secondary care based treatment. (observational study, evidence level: IV; study quality: moderate).

Riddle *et al* (2004) conducted a study of diagnosis of proximal lower-extremity deep vein thrombosis (PDVT). 909 (65% response rate) physical therapists completed the survey. In 4 of 6 vignettes, a majority of therapists either over or underestimated proximal lower-extremity deep vein thrombosis probability. For the two high-probability vignettes, 87% and 64% of the physical therapists underestimated the probability of PDVT, and 32% and 27% reported that they would not have contacted the physician. The authors conclude that the data suggest that over 2.000 therapists in the population (approximately 25%) would be likely not to contact the referring physician when seeing a patient with a high probability of PDVT. (observational study, evidence level: IV; study quality: moderate).

A postal survey by Schmid *et al* (2008) found poor levels of awareness of secondary stroke treatment protocols. Thirty-four surveys (45%) were returned from six facilities. Half of the therapists were unaware of the Veteran Association secondary stroke guidelines, and half did not offer health promotion advice. However, physical therapists were significantly more likely to do so than occupational therapists. (observational study, evidence level: IV; study quality: poor).

iii. Audiology

Zapala *et al* (2010) conducted a retrospective chart review study comparing assessment and treatment plans developed by audiologists and otolaryngologists in the US. Blinded assessments of 1550 records comprising all Medicare eligible patients referred to the Audiology Section of the Mayo Clinic Florida in 2007 with a primary complaint of hearing impairment were held. Audiologist treatment plans did not differ substantially from otolaryngologist plans for the same condition. There was no convincing evidence that audiologists missed significant symptoms of otologic disease; and there was strong evidence that audiologists referred to otolaryngology when appropriate. The author concluded that

audiology direct access would not pose a safety risk to Medicare beneficiaries complaining of hearing impairment. (observational study, evidence level: III-3; study quality: good).

Swan *et al* (1994), in a UK study, investigated how well technicians at a direct referral clinic for the provision of a hearing aid could screen to identify those meriting an otolaryngological opinion. Two hundred and forty-eight patients were evaluated by technicians using strict audiometric and tympanometric criteria. One hundred and twenty-five patients (50 per cent) failed these criteria and were referred to an otologist. The remaining 123 (50 per cent) were managed by technicians but were subsequently reviewed for the purpose of this study by an otologist and their management assessed. In only two patients (one per cent) was it thought that the initial management would have been different if seen by an otologist. The authors conclude that using the study's conservative guidelines meant that the risk of any significant pathology being overlooked was minimal, and that direct referral could provide an adequate service if sufficiently well organized and monitored. (observational study, evidence level: IV; study quality: moderate).

Key Findings and Conclusions

What factors emerge as the major impacts, including risks and benefits, of introducing direct access, and what evidence was found?

The following nine factors emerged from the review as the potential major impacts, including risks and benefits, of introducing direct access. Studies providing evidence found for these factors are indicated. We have grouped the first 6 of these factors under the research questions relating to risks and benefits to patients.

h) Is there any evidence to show that risks to patients/clients have been increased by the introduction of direct access?

(i) Risks to patient safety

In 7 studies that examined aspects of patient safety, none provided any evidence of increased risk (Battrell *et al* (2008), Bolin (2008), Bader *et al* (2011), Wetterhall *et al* (2010), Williard *et al* (2011), Wang (2011), Scofield *et al* (2005). Quality of evidence: moderate/good in 5 of 7 studies.

However two of the above studies mentioned evidence of deficiencies in facilities and equipment, Bolin in respect to radiographs, and Wetterhall *et al* regarding sterilisation and equipment. Note that both these studies refer to the Alaska DHATs, who work in remote and under-served tribal localities. Quality of evidence: moderate/good in 2 of 2 studies.

The two descriptive Childsmile papers (Macpherson et al, 2010; Turner et al, 2010) do not present data directly pertaining to safety issues and Extended Duties Dental Nurses (EDDNs) acting under direct access arrangements. However no significant adverse events have been recorded in this programme in over 168,000 fluoride varnish applications (personal communication, Childsmile Central Evaluation and Research Team, Glasgow Dental School, June 2012).

(ii) Risks relating to diagnosis and referral decision-making

Eleven studies were found which looked at the quality of DCPs' referral decision-making. Four (Wang, 2011, Kwan *et al*, 1998, Simmer-Beck *et al,* 2011, Brockenhurst *et al*, 2012) found evidence of poor specificity (i.e. referring a high proportion of problematic cases but also a significant number of non-problematic cases), leading to over-referral and unnecessary consultations. However Hawley *et al* (1999) reported

under-referral. Hopcraft et al (2011) noted good agreement re referral between DCP and dentist, but Metz *et al* (2011) noted problems in getting dentist to accept referrals. Perry *et al* (1997) reported good uptake of referrals by adult patients, while Simmer-Beck *et al* (2011) reported a low uptake of referrals from a school dental service.

Lopez-Jornet *et al* (2006) and Nicoleta *et al* (2004) found knowledge and training deficiencies regarding oral cancer detection among dental hygienists, while Turner *et al* (2011) report a lack of confidence amongst hygienists' and therapists in their own ability to detect possible oral cancer. None of these three studies compared DCPs' knowledge with that of dentists.
Quality of evidence: moderate/good in 10 of 11 studies.

(iii) **Support to patients.** Seven studies looked at aspects of DCPs' knowledge or support to patients regarding smoking cessation (Brothwell *et al* (2008), Chambers *et al* (1996), Lopez-Jornet *et a*l (2006), Nicolera *et al* (2004), diabetes (Boyd *et al* (2008)), child abuse (Chadwick *et al* (2009)) and domestic violence (Mascarenas et al (2009). All but Brothwell *et al* found deficiencies in DCPs' knowledge or support to patients, but there is no evidence from these studies to suggest that dentists were any better in these respects. Quality of evidence: moderate/good in 5 of 7 studies.

i) Is there any evidence to show that patients/clients benefit from the introduction of direct access?

(i) **Increased access to dental care, both preventive and restorative**

The following studies provide evidence that the deployment of dental therapists and dental hygienists in indirect or general supervision or unsupported by a dentist resulted in greater access to and use of dental services by under-served groups and communities (Freed et al (1997), Perry et al (1997), Metz et al (2011), Squillace (2012), Bolin (2008), Wetterhall et al (2010, 2011), Calache et al (2009), Simmer-Beck et al (2011), Mitchell et al (2006) (dental assistants). Quality of evidence: moderate/good in 7 of 10 studies.

There is a limited amount of evidence regarding the work of dental nurses or dental assistants. Mitchell et al studied the impact on access of a new type of dental assistant ("scaling assistants") in Maine, USA, and concluded that workforce data suggested an increase in access to dental care. In the UK, Extended Duties Dental Nurses (EDDNs) may effectively act under direct access in limited settings of day

nursery and primary schools, in that they provide preventive care, including fluoride varnish treatment, with only general supervision from a dentist. Routinely collected monitoring data from the Scottish Childsmile programme (Macpherson et al, 2010; Turner et al, 2010) indicates that in addition to any gain in the protection of children's teeth, access to restorative care is likely to have been increased. In over 108,000 appointments for fluoride varnish application completed in 2011, 22% resulted in parents being recommended to take their child for care from a dental practice, usually because untreated caries had been detected by the EDDNs. (personal communication, Childsmile Central Evaluation and Research Team, Glasgow Dental School, June 2012).

(ii) Cost savings to patients and the public purse

Three studies (Wang (2011), Baillit *et al* (2008), Devlin (1994)) suggest variable and at most modest benefits regarding cost savings to the patients and service providers. Quality of evidence: moderate/good in 2 of 3 studies.

(iii) Patient satisfaction

Six studies (Freed *et al* (1997), Wetterhall *et al* (2011), Calache *et al* (2009, 2011), Simmer-Beck *et al* (2011) and Hakenberg *et al* (2008)) gave consistent findings that patient satisfaction was high and/or dental anxiety low among dental hygienist and dental therapist patients. The studies by Freed *et al* (1997) and Hakenberg *et al* (2008) found higher satisfaction amongst patients of independent dental hygienist practices than amongst dentists' patients. Quality of evidence: moderate/good in 4 of 6 studies.

Other factors

(i) More effective use of scarce resources (i.e. dentists' time)

The evidence for savings in dentists' time or other resources was all US-based (Perry *et al* (1997), Baillit *et al* (2008), Mitchell *et al* (2006), and inconclusive. Of course, if access to dental care is widened, and appropriate referrals made for dentists, demands on that level of service may rise. Quality of evidence: moderate in 1 of 3 studies.

(ii) Higher Job satisfaction among Dental Therapists and Hygienists

There is evidence from two studies (Metz *et al* (2011), Turner *et al* (2011)) that DCPs' job satisfaction is higher when they work to their full remit and training. Quality of evidence: moderate in 2 of 2 studies.

(iii) Concerns and lack of knowledge of professional and patients regarding direct access.

Both dentists and patients in several studies have shown mixed views about DCPs providing treatment. These findings contradict the conclusions of studies involving patients of DCPs (point iii above). The introduction of direct access will require education and the preparation of information for health professionals, patients and parents. (Hopcraft et al, (2008), Abelsen et al (2008), Turner et al, (2011), Dyer et al (2008, 2009). Quality of evidence: moderate in 5 of 5 studies.

Challenges/mitigation of risk

Potential barriers to direct access identified through the direct access literature search relate to practitioner and patient attitudes towards an extended DCP role. Attitudes among both dentists and patients tended to be more positive with direct experience of working with or being treated by DCPs, and DCPs themselves were confident in their abilities to work more independently (Hopcraft (2000), Abelsen (2008), Turner (2011), Dyer (2008, 2009). Five approaches to the mitigation of risk were identified: limitations of clinical remit, patient groups or settings; stipulated levels of experience, qualification or post-graduate training; formal supervision by dentists; audit and inspection arrangements; and line management structures.

There is little evidence to evaluate or compare these approaches. However Scofield *et al* (2005) reports that there were no reported disciplinary actions against dental hygienists in respect to the administration of anaesthesia in 13 responding States over a ten year period. Anecdotal evidence that US dental hygiene malpractice insurance premiums are the same regardless of the level of supervision the hygienist practices under or the range of clinical services she performs (source: personal communication, American Dental Hygienist Association, June 2012) supports Scofield's conclusion that dental hygienists successfully and safely administer local anaesthetics to dental patients under varying supervision arrangements. The implications of this material are that there may be no significantly higher risk to patients irrespective of the different levels of supervision established in different States.

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Other sources

The following organisations and individuals kindly responded to our request for information and contacts.

American Dental Assistants Association

American Dental Hygienists' Association

British Dental Association

British Society of Dental Hygiene and Therapy

Canadian Dental Assistants' Association

Canadian Dental Hygienists' Association

College of Dental Hygienists of Ontario

Dental Hygienists Association of Australia

Dental Technologists Association

Dutch Society of Dental Hygienists in The Netherlands

Faculty of Dentistry, University of Otago, New Zealand

International Federation of Dental Hygienists

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List of appendices

Appendix 1: Scope of practice documents

Appendix 2: Individual projects and roles

Appendix 3: Review papers

Appendix 4: Position papers